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March, 1887

THE WORKS
OF
BENJAMIN FRANKLIN

VOL. II.

1744-1757

THE COMPLETE WORKS
OF
BENJAMIN FRANKLIN

INCLUDING

HIS PRIVATE AS WELL AS HIS OFFICIAL AND SCIENTIFIC CORRESPONDENCE, AND
NUMEROUS LETTERS AND DOCUMENTS NOW FOR THE FIRST TIME
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ALSO

THE UNMUTILATED AND CORRECT VERSION OF HIS AUTOBIOGRAPHY

COMPILED AND EDITED

BY

JOHN BIGELOW

"Strange that Ulysses does a thousand things so well."—*ILLAD*, B. II, 335

VOL. II.

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XXXI.

TO THE HON. CADWALLADER COLDEN.

NEW YORK, 5 April, 1744.

SIR :—Happening to be in this city about some particular affairs, I have the pleasure of receiving yours of the 28th past, here ; and can now acquaint you that the Society,¹ as far as it relates to Philadelphia, is actually formed, and has had several meetings to mutual satisfaction. As soon as I get home I shall send you a short account of what has been done and proposed at these meetings. The members are :

Dr. Thomas Bond, as Physician.

Mr. John Bartram, as Botanist.

Mr. Thomas Godfrey, as Mathematician.

Mr. Samuel Rhoads, as Mechanician.

Mr. William Parsons, as Geographer.

Dr. Phineas Bond, as General Nat. Philosopher.

Mr. Thomas Hopkinson, President.

Mr. William Coleman, Treasurer.

B. F——, Secretary.

To whom the following members have since been added, viz. : Mr. Alexander, of New York ; Mr.

¹ The American Philosophical Society, as afterwards instituted, was formed out of two societies, of which this was one. The other was the Society for Promoting and Propagating Useful Knowledge. The two societies

were incorporated into one, called the American Philosophical Society, in December, 1768, and in January, 1769, Franklin was elected the first president, although he was at that time in England.

Morris, Chief Justice of the Jerseys ; Mr. Home, Secretary of do. ; Mr. John Coxe, of Trenton ; and Mr. Martyn, of the same place. Mr. Nicholls tells me of several other gentlemen of this city that incline to encourage the thing ; and there are a number of others, in Virginia, Maryland, and the New England colonies, we expect to join us as soon as they are acquainted that the Society has begun to form itself.

I am, Sir, with much respect,

Your most humble servant,

B. FRANKLIN.

XXXII.

TO JOSIAH AND ABIAH FRANKLIN.

PHILADELPHIA, 6 September, 1744.

HONORED FATHER AND MOTHER :

I apprehend I am too busy in prescribing and meddling in the doctor's sphere, when any of you complain of ails in your letters. But as I always employ a physician myself when any disorder arises in my family, and submit implicitly to his orders in every thing, so I hope you consider my advice, when I give any, only as a mark of my good will, and put no more of it in practice than happens to agree with what your doctor directs.

Your notion of the use of strong lye I suppose may have a good deal in it. The salt of tartar, or salt of wormwood, frequently prescribed for cutting, opening, and cleansing, is nothing more than the salt of lye procured by evaporation. Mrs. Stevens's medi-

cine for the stone and gravel, the secret of which was lately purchased at a great price by the Parliament, has for its principal ingredient salt, which Boerhaave calls the most universal remedy. The same salt intimately mixed with oil of turpentine, which you also mentioned, makes the *sapo philosophorum*, wonderfully extolled by some chemists for like purposes. It is highly probable, as your doctor says, that medicines are much altered in passing between the stomach and bladder; but such salts seem well fitted in their nature to pass with the least alteration of almost any thing we know; and, if they will not dissolve gravel and stone, yet I am half persuaded that a moderate use of them may go a great way towards preventing these disorders, as they assist a weaker digestion in the stomach, and powerfully dissolve crudities such as those which I have frequently experienced. As to honey and molasses, I did not mention them merely as openers and looseners, but also from conjecture that, as they are heavier in themselves than our common drink, they might when dissolved in our bodies increase the gravity of our fluids, the urine in particular, and by that means keep separate and suspended therein those particles which, when unused, form gravel, &c.

I will inquire after the herb you mention. We have a botanist here, an intimate friend of mine, who knows all the plants in the country. He would be glad of the correspondence of some gentlemen of the same taste with you, and has twice, through my hands, sent specimens of the famous Chinese *ginseng*,

found here, to persons who desired it in Boston, neither of whom has had the civility to write him a word in answer, or even to acknowledge the receipt of it, of which please to give a hint to brother John.

We have had a very healthy summer and a fine harvest ; the country is filled with bread ; but as trade declines since the war began, I know not what our farmers will do for a market. I am your affectionate and dutiful son,

B. FRANKLIN.

XXXIII.

TO CADWALLADER COLDEN.

PHILADELPHIA, 15 August, 1745.

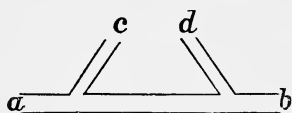
SIR :—I received your favor of the 20th past, with your medical piece enclosed, the reading of which gave me a great deal of pleasure. I showed it to our friend Mr. Bartram, who carried it home, and, as he since tells me, is taking a copy of it. His keeping of it for that end has prevented my showing it to any other gentleman as you desired, and hitherto prevented my writing to you upon it, as I intended. But, lest you should conclude me the very worst correspondent in the world, I shall delay no longer giving you some thoughts that occurred to me in reading of it, choosing rather to be blamed for not writing to the purpose than for not writing at all.

I am extremely pleased with your doctrine of the *absorbent vessels* intermixed with the perspiratory ducts, both on the external and internal superficies of the body. After I had read Sanctorius, I imagined

a constant stream of the perspirable matter issuing at *every* pore in the skin. But then I was puzzled to account for the effects of mercurial unctions for the strangury, sometimes occasioned by an outward application of the flies, and the like ; since whatever virtue or quality might be in a medicine laid upon the skin, if it would enter the body it must go against wind and tide, as one may say. Dr. Hales helped me a little when he informed me, in his *Vegetable Statics*, that the body is not always in a perspirable, but sometimes in an *imbibing, state*, as he expresses it, and will at times actually grow heavier by being exposed to moist air. But this did not quite remove my difficulty, since, as these fits of imbibing did not appear to be regular or frequent, a blistering plaster might lie on the body a week, or a mercurial unguent be used a month, to no purpose, if the body should so long continue in a perspirable state. Your doctrine, which was quite new to me, makes all easy, since the body may perspire and absorb at the same time, through the different ducts destined to those different ends.

I must own, however, that I have one objection to the explanation you give of the operation of these absorbents. That they should communicate with the veins, and the perspirants with the arteries only, seems natural enough ; but as all fluids by the hydrostatical law pass equally in all directions, I question whether the *mere direction* of one of those minute vessels, where it joins with a vein or artery, *with* or *against* the stream of blood in the larger vessel, would be sufficient to produce such contrary effects as *perspir-*

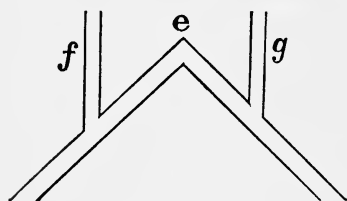
ing and *absorbing*. If it would, both perspirants and absorbents might proceed from the arteries only, or from the veins only, or from both indifferently ; as,



by the figure in the margin, whether the vessel *a b* is an artery or a vein, if the stream moves from *a* to *b*, the mi-

nute communicating vessel *c* shall be a perspirant, and *d* an absorbent ; and the contrary, if it moves from *b* to *a*. Yet I cannot say I am certain the mere direction of the vessel will have no effect ; I only suspect it, and am making a little machine to try an experiment with for satisfaction.

It is a siphon made of two large joints of Carolina cane united at *e*, into which two small glass tubes, *f*



and *g*, are to be inserted, one on the descending and the other on the ascending side. I propose to fill the siphon and the two glass tubes with water, and,

when it is playing, unstop at the same instant the tops of both glass tubes, observing in which the water sinks fastest. You shall know the success. I conceive the pressure of the atmosphere on the apertures of the two glass tubes to be no way different from the pressure of the same on the mouths of the perspirants and absorbents, and if the water sinks equally in the two tubes, notwithstanding the direction of one against and the other with the stream, I shall be ready to think we must look out for another

solution. You will say, perhaps, that it will then be time enough when the experiment is tried, and succeeds as I suspect ; yet I cannot forbear attempting at one beforehand while some thoughts are present in my mind. If a new solution should be found necessary, this may be ready for consideration.

I do not remember that any anatomist that has fallen in my way has assigned any other cause of the motion of the blood through its whole circle than the contractile force of the heart, by which that fluid is driven with violence into the arteries, and so continually propelled by repetitions of the same force till it arrives at the heart again. May we for our present purpose suppose another cause producing half the effect, and say that the ventricles of the heart, like syringes, *draw* when they dilate as well as force when they contract ? That this is not unlikely may be judged from the valves nature has placed in the arteries to prevent the drawing back of the blood in those vessels when the heart dilates, while no such obstacles prevent its sucking (to use the vulgar expression) from the veins. If this be allowed, and the insertion of the absorbents into the veins and of the perspirants into the arteries be agreed to, it will be of no importance in what direction they are inserted. For, as the branches of the arteries are continually lessening in their diameters, and the motion of the blood decreasing by means of the increased resistance, there must, as more is constantly pressed on behind, arise a kind of *crowding* in the extremities of those vessels, which will naturally *force out* what is contained in the

perspirants that communicate with them. This lessens the quantity of blood, so that the heart cannot receive again by the veins all it had discharged into the arteries, which occasions it to draw strongly upon the absorbents that communicate with them. And thus the body is continually perspiring and imbibing. Hence after long fasting the body is more liable to receive infection from bad air, and food, before it is sufficiently chylified, is drawn crude into the blood by the absorbents that open into the bowels.

To confirm this position, that the heart *draws* as well as *drives* the blood, let me add this particular. If you sit or lean long in such a manner as to compress the principal artery that supplies a limb with blood, so that it does not furnish a due quantity, you will be sensible of a pricking pain in the extremities like that of a thousand needles, and the veins, which used to raise your skin in ridges, will be (with the skin) sunk in channels, the blood being drawn out of them, and their sides pressed so closely together that it is with difficulty and slowly that the blood afterwards enters them when the compressed artery is relieved. If the blood was not drawn by the heart, the compression of an artery would not empty a vein, and I conjecture that the pricking pain is occasioned by the sides of the small vessels being pressed together.

I am not without apprehension that this hypothesis is either not new, or, if it is new, not good for any thing. It may, however, in this letter, with the enclosed paper on a kindred subject, serve to show the great confidence I place in your candor, since to you

I so freely hazard myself (*ultra crepidam*) in meddling with matters directly pertaining to your profession, and entirely out of the way of my own. If you give yourself the trouble of reading them, it is all I can modestly expect. Your silence about them afterwards will be sufficient to convince me that I am in the wrong, and that I ought to study the sciences I dabble in before I presume to set pen to paper. I will endeavour, however, to make you some amends by procuring you from better judges some better remarks on the rest of your piece, and shall observe your caution not to let them know from whom I had it.

The piece on Fluxions I purpose shortly to read again, and that on the several species of matter, when you shall have what little I shall be able to say about them.

The members of our Society here are very idle gentlemen. They will take no pains. I must, I believe, alter the scheme and proceed with the papers I have, and may receive, in the manner you advise in one of your former letters. The mention of your former letters puts me in mind how much I am in arrear with you. Like some honest insolvent debtors, I must resolve to pay ready money for what I have hereafter, and discharge the old debt by little and little as I am able.

The impertinence of these mosquitos to me (now I am in the humor of writing) prevents a great deal of mine to you, so that, for once, they are of some use in the world. I am, Sir,

Your most humble servant,

B. FRANKLIN.

XXXIV.

TO CADWALLADER COLDEN.

PHILADELPHIA, 28 November, 1745.

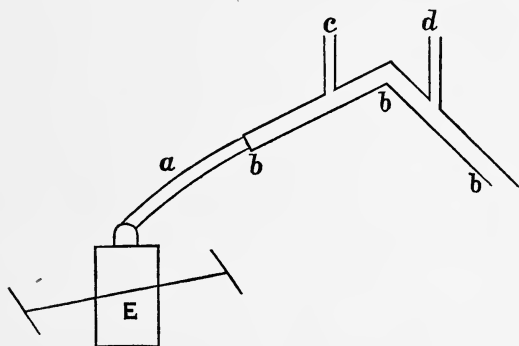
SIR :—I shall be very willing and ready, when you think proper to publish your piece on gravitation, to print it at my own expense and risk. If I can be the means of communicating any thing valuable to the world, I do not always think of gaining, nor even of saving, by my business ; but a piece of that kind, as it must excite the curiosity of all the learned, can hardly fail of bearing its own expense.

I must not pretend to dispute with you on any part of the animal economy. You are quite too strong for me. I shall just mention two or three little things, that I am not quite clear in.

If there is no contrivance in the frame of the auricles or ventricles of the heart by which they dilate themselves, I cannot conceive how they are dilated. It is said, by the force of the venal blood rushing into them. But if that blood has no force which was not first given to it by the contraction of the heart, how can it (diminished as it must be by the resisting friction of the vessels it has passed through) be strong enough to overcome that contraction ? Your doctrine of fermentation in the capillaries helps me a little ; for if the returning blood be rarefied by the fermentation, its motion must be increased ; but, as it seems to me that it must by its expansion resist the arterial blood behind it, as much as it accelerates the venal blood before it, I am still somewhat unsatisfied. I have

heard or read somewhere, too, that the hearts of some animals continue to contract and dilate, or to beat, as it is commonly expressed, after they are separated from the other vessels and taken out of the body. If this be true, their dilation is not caused by the force of the returning blood.

I should be glad to satisfy myself, too, whether the blood is always quicker in motion when the pulse beats quicker. Perhaps more blood is driven forward by one strong, deep stroke than by two that are weak and light ; as a man may breathe more air by one long, common respiration, when in health, than by two quick, short ones in a fever. I applied the siphon I mentioned to you in a former letter to the pipe of



a water-engine. *E* is the engine ; *a*, its pipe ; *b b b*, the siphon ; *c* and *d*, the two glass pipes communicating with the siphon. Upon working the engine, the water flowed through the siphon and the glass tube *c* ; but none was discharged through *d*. When I stopped with my finger the end of the siphon, the water issued at both glass tubes with equal force, and

on only half stopping the end of the siphon, it did the same. I imagine the sudden bending of the siphon gives such a resistance to the stream as to occasion its issuing out of the glass tube *c*. But I intend to try a farther experiment, of which I shall give you an account.

I am now determined to publish an *American Philosophical Miscellany*, monthly or quarterly. I shall begin with next January, and proceed as I find encouragement and assistance. As I purpose to take the compiling wholly upon myself, the reputation of no gentleman or society will be affected by what I insert of another's; and that perhaps will make them more free to communicate. Their names shall be published or concealed, as they think proper, and care taken to do exact justice to matters of invention, &c. I shall be glad of your advice in any particulars that occurred to you in thinking of this scheme; for, as you first proposed it to me, I doubt not but you have well considered it.¹

I have not the original of Dr. Mitchell's tract on the Yellow Fever.² Mine is a copy I had taken, with his leave, when here. Mr. Evans will make a copy of it for you.

I hope it will be confirmed by future experiment that the *yaws* are to be cured by tar-water. The case

¹ It does not appear that this scheme was ever carried into execution.

² Dr. John Mitchell was a learned physician and botanist, and Fellow of the Royal Society. He was a native of England, but came over and established himself in Virginia. Dr. Mil-

ler says that "he wrote ably on the yellow fever, as it appeared in Virginia in 1742; and that his instructive manuscripts on this subject fell into the hands of Dr. Franklin, by whom they were communicated to Dr. Rush."—Miller's "Retrospect," vol. i., p. 318.

you relate to Dr. Mitchell gives great hopes of it, and should be published, to induce people to make trials. For, though it should not always succeed, I suppose there is no danger of its doing any harm.

As to your pieces on Fluxions and the different species of matter, it is not owing to reservedness that I have not yet sent you my thoughts ; but because I cannot please myself with them, having had no leisure yet to digest them. If I was clear that you are anywhere mistaken, I would tell you so, and give my reasons with all freedom, as believing nothing I could do would be more obliging to you. I am persuaded you think, as I do, that he who removes a prejudice or an error from our minds contributes to their beauty, as he would do to that of our faces who should clear them of a wart or a wen.

I have a friend gone to New York with a view of settling there, if he can meet with encouragement. It is Dr. John Bard,¹ whom I esteem an ingenious physician and surgeon and a discreet, worthy, and honest man. If, upon conversation with him, you find this character just, I doubt not but you will afford him your advice and countenance, which will be of great service to him in a place where he is entirely a stranger, and very much oblige, Sir,

Your most humble servant,

B. FRANKLIN.

P. S.—I shall forward your letter to Dr. Mitchell. Thank you for leaving it open for my perusal.

¹ The father of Dr. Samuel Bard, of whom an interesting memoir has been published by Professor McVickar.

XXXV.

TO CADWALLADER COLDEN.

[Date uncertain.]

SIR :—I received yours with others enclosed for Mr. Bartram and Mr. Armit, to which I suppose the enclosed are answers. The person who brought yours said he would call for answers, but did not ; or if he did, I did not see him.

I understand Parker¹ has begun upon your piece. A long sitting of our Assembly has hitherto hindered me from beginning the *Miscellany*. I shall write to Dr. Gronovius as you desire.

I wish I had mathematics enough to satisfy myself whether the much shorter voyages made by ships bound hence to England, than by those from England hither, are not in some degree owing to the diurnal motion of the earth, and if so, in what degree. It is a notion that has lately entered my mind ; I know not if ever any other's. Ships in a calm at the equator move with the sea fifteen miles per minute ; at our Cape suppose twelve miles per minute ; in the British Channel suppose ten miles per minute. Here is a difference of two miles' velocity per minute between Cape Henlopen and the Lizard. No small matter in so weighty a body as a laden ship swimming in a fluid. How is this velocity lost in the voyage thither, if not by the resistance of the water ? And if so, then the water, which resisted in part, must have given way in part to the ship, from time

¹ A printer in New York.

to time, as she proceeded continually out of parallels of latitude where the earth's motion or rotation was quicker, into others where it was slower. And thus, as her velocity tends eastward with the earth's motion, she perhaps makes her easting sooner. Suppose a vessel lying still in a calm at our Cape could be taken up, and the same instant set down in an equal calm in the English Channel, would not the difference of velocity between her and the sea she was placed in appear plainly by a violent motion of the ship through the water eastward?

I have not time to explain myself farther, the post waiting ; but I believe I have said enough for you to comprehend my meaning. If the reasons hinted at should incline you to think there is any thing in this notion, I should be glad of an answer to this question, if it be capable of a precise answer, viz.

Suppose a ship sails in a northeast line from latitude 39 to latitude 52, in thirty days, how long will she be returning on the same line, winds, currents, etc., being equal? Just so much as the eastern motion of the earth helps her easting, I suppose it will hinder her westing. Perhaps the weight and dimensions or shape of the vessel should be taken into consideration, as the water resists bodies of different shapes differently.

I must beg you to excuse the incorrectness of this scrawl, as I have not time to transcribe. I am, Sir,

Your most humble servant,

B. FRANKLIN.

XXXVI.

TO JOHN FRANKLIN, AT BOSTON.

PHILADELPHIA, 1745.

— Our people are extremely impatient to hear of your success at Cape Breton.¹ My shop is filled with inquirers at the coming in of every post. Some wonder the place is not yet taken. I tell them I shall be glad to hear that news three months hence. Fortified towns are hard nuts to crack ; and your teeth have not been accustomed to it. Taking strong places is a particular trade, which you have taken up without serving an apprenticeship to it. Armies and veterans need skilful engineers to direct them in their attack. Have you any? But some seem to think forts are as easy taken as snuff. Father Moody's prayers look tolerably modest. You have a fast and prayer day for that purpose ; in which I compute five hundred thousand petitions were offered up to the same effect in New England, which, added to the petitions of every family morning and evening, multiplied by the number of days since January 25th, make forty-five millions of prayers ; which, set against the prayers of a few priests in the garrison, to the Virgin Mary, give a vast balance in your favor.

If you do not succeed, I fear I shall have but an indifferent opinion of Presbyterian prayers in such cases, as long as I live. Indeed, in attacking strong towns I should have more dependence on *works*, than on *faith* ; for, like the kingdom of heaven, they are

¹ The expedition against Cape Breton proved successful, by the surrender of

Louisburg, on the 17th of June. The news arrived in Boston on the 3d of July.

to be taken by force and violence ; and in a French garrison I suppose there are devils of that kind that they are not to be cast out by prayers and fasting, unless it be by their own fasting for want of provisions. I believe there is Scripture in what I have wrote, but I cannot adorn the margin with quotations, having a bad memory, and no Concordance at hand ; besides no more time than to subscribe myself, &c.

B. FRANKLIN.

XXXVII.

TO JAMES READ.

Saturday Morning, 17 August, 1745.

DEAR JEMMY :

I have been reading your letter over again, and, since you desire an answer I sit down to write you one ; yet, as I write in the market, it will, I believe, be but a short one, though I may be long about it. I approve of your method of writing one's mind, when one is too warm to speak it with temper ; but, being quite cool myself in this affair, I might as well speak as write, if I had an opportunity.

Are you an attorney by profession, and do you know no better how to choose a proper court in which to bring your action ? Would you submit to the decision of a husband, a cause between you and his wife ? Don't you know that all wives are in the right ? It may be you don't, for you are yet but a young husband. But see, on this head, the learned Coke, that oracle of the law, in his chapter *De Fur. Marit. Angl.*

I advise you not to bring it to trial ; for, if you do, you will certainly be cast.

Frequent interruptions make it impossible for me to go through all your letter. I have only time to remind you of the saying of that excellent old philosopher, Socrates, *that, in differences among friends, they that make the first concessions are the wisest ;* and to hint to you that you are in danger of losing that honor in the present case, if you are not very speedy in your acknowledgments, which I persuade myself you will be, when you consider the sex of your adversary.

Your visits never had but one thing disagreeable in them—that is, they were always too short. I shall exceedingly regret the loss of them, unless you continue, as you have begun, to make it up to me by long letters.

I am, dear Jemmy, with sincere love to our dearest Suky, your very affectionate friend and cousin,

B. FRANKLIN.

XXXVIII.

THE SPEECH OF POLLY BAKER.

The Speech of Miss Polly Baker before a Court of Judicatory, in New England, where she was prosecuted for a fifth time, for having a Bastard Child ; which in-

¹ Two of the more elaborate of Franklin's jokes in the *Pennsylvania Gazette*, says Mr. Parton in his charming biography of Franklin, have escaped the vigilance of editors hitherto. The speech of Polly Baker is one of these ; which is not only humorous, but well rebukes the cruel immorality which sent a poor miserable drab to the whipping-post, and invited her seducer to dinner. This speech was a current joke in the colonial press for thirty years, and continued to be occasionally reprinted after the Revolution. It was inserted in the *Gazette*, Franklin tells us, to amuse the town at a time when there was little news stirring.

fluenced the Court to dispense with her punishment, and which induced one of her judges to marry her the next day—by whom she had fifteen children.

“ May it please the honourable bench to indulge me in a few words : I am a poor, unhappy woman, who have no money to fee lawyers to plead for me, being hard put to it to get a living. I shall not trouble your honours with long speeches ; for I have not the presumption to expect that you may, by any means, be prevailed on to deviate in your sentence from the law, in my favour. All I humbly hope is, that your honours would charitably move the governor’s goodness on my behalf, that my fine may be remitted. This is the fifth time, gentlemen, that I have been dragged before your court on the same account ; twice I have paid heavy fines, and twice I have been brought to public punishment, for want of money to pay those fines. This may have been agreeable to the laws, and I don’t dispute it ; but since the laws are sometimes unreasonable in themselves, and therefore repealed ; and others bear too hard on the subject in particular instances, and therefore there is left a power somewhere to dispense with the execution of them, I take the liberty to say, that I think this law, by which I am punished, both unreasonable in itself, and particularly severe with regard to me, who have always lived an inoffensive life in the neighbourhood where I was born, and defy my enemies (if I have any) to say I have wronged any man, woman, or child. Abstracted from the law, I cannot conceive (may it please your

honours) what the nature of my offence is. I have brought five children into the world, at the risque of my life ; I have maintained them well by my own industry, without burthening the township, and would have done it better, if it had not been for the heavy charges and fines I have paid. Can it be a crime (in the nature of things, I mean) to add to the King's subjects, in a new country that really wants people ? I own it, I should think it rather a praiseworthy than a punishable action. I have debauched no other woman's husband, nor enticed any youth ; these things I never was charged with ; nor has any one the least cause of complaint against me, unless, perhaps, the ministers of justice, because I have had children without being married, by which they have missed a wedding fee. But can this be a fault of mine ? I appeal to your honours. You are pleased to allow I don't want sense ; but I must be stupefied to the last degree, not to prefer the honourable state of wedlock to the condition I have lived in. I always was, and still am willing to enter into it ; and doubt not my behaving well in it, having all the industry, frugality, fertility, and skill in economy appertaining to a good wife's character. I defy any one to say I ever refused an offer of that sort ; on the contrary, I readily consented to the only proposal of marriage that ever was made me, which was when I was a virgin, but too easily confiding in the person's sincerity that made it, I unhappily lost my honour by trusting to his ; for he got me with child, and then forsook me.

“ That very person, you all know, he is now become

a magistrate of this country ; and I had hopes he would have appeared this day on the bench, and have endeavoured to moderate the Court in my favour ; then I should have scorned to have mentioned it ; but I must now complain of it, as unjust and unequal, that my betrayer, and undoer, the first cause of all my faults and miscarriages (if they must be deemed such), should be advanced to honor and power in the government that punishes my misfortunes with stripes and infamy. I should be told, 'tis like, that were there no act of Assembly in the case, the precepts of religion are violated by my transgressions. If mine is a religious transgression, leave it to religious punishment. You have already excluded me from the comforts of your church communion. Is not that sufficient? What need is there then of your additional fines and whipping? You believe I have offended heaven, and must suffer eternal fire ; will not that be sufficient? I own I do not think as you do, for, if I thought what you call a sin was really such, I could not presumptuously commit it. But how can it be believed that Heaven is angry at my having children, when to the little done by me towards it, God has been pleased to add his divine skill and admirable workmanship in the formation of their bodies, and crowned the whole by furnishing them with rational and immortal souls? Forgive me, gentlemen, if I talk a little extravagantly on these matters : I am no divine, but if you, gentlemen, must be making laws, do not turn natural and useful actions into crimes by your prohibitions. But take into your wise consideration the great and

growing number of bachelors in the country, many of whom, from the mean fear of the expense of a family, have never sincerely and honestly courted a woman in their lives ; and by their manner of living leave unproduced (which is little better than murder) hundreds of their posterity to the thousandth generation. Is not this a greater offence against the public good than mine? Compel them, then, by law, either to marriage, or to pay double the fine of fornication every year. What must poor young women do, whom customs and nature forbid to solicit the men, and who cannot force themselves upon husbands, when the laws take no care to provide them any, and yet severely punish them if they do their duty without them ; the duty of the first and great command of nature and nature's God, increase and multiply ; a duty, from the steady performance of which nothing has been able to deter me, but for its sake I have hazarded the loss of the public esteem, and have frequently endured public disgrace and punishment ; and therefore ought, in my humble opinion, instead of a whipping, to have a statue erected to my memory."

XXXIX.

THE DRINKER'S DICTIONARY.

A.

He is addled.
 He's casting up his accounts.
 afflicted.
 in his airs,

B.

He's Biggy.
 Bewitched.
 Block and Block.
 Boozy.

He's Bowz'd.	He's heat his Copper.
Been at Barbadoes.	Crocus.
Drunk as a Wheelbarrow.	Catch'd.
Burdock'd.	He cuts his Capers.
Busky.	He's been in the Cellar.
Buzzey.	in his Cups.
Has stole a Manchet out of the	Non Compos.
Brewer's Basket.	Cock'd.
His head is full of Bees.	Curv'd.
Has been in the Bibbing Plot.	Cut.
drank more than he has	Chipper.
bled.	Chickery.
He's Bungey.	Loaded his Cart.
As drunk as a Beggar.	Been too free with the
He sees the Bears.	Creature.
He's kiss'd Black Betty.	Sir Richard has taken off his
had a thump over the	Considering Cap.
head with Sampson's	He's Chap-fallen.
Jawbone.	
Bridgey.	D.
	He's Disguiz'd.
C.	Got a Dish.
He's Cat.	Killed his Dog.
Cagrin'd.	Took his Drops.
Capable.	It is a Dark Day with him.
Cramp'd.	He's a Dead Man.
Cherubimical.	Has Dipp'd his Bill.
Cherry Merry.	He's Dagg'd.
Wamble Crop'd.	seen the Devil.
Crack'd.	
Concern'd.	E.
Half way to Concord.	He's Prince Eugene.
Has taken a Chirripping-Glass.	Enter'd.
Got Corns in his head.	Wet both Eyes.
A Cup too much.	Cock Ey'd.
Coguy.	Got the Pole Evil.
Copey.	Got a brass Eye.

He's Made an Example.

Eat a Load & a half for
breakfast.

In his Element.

F.

He's Fishey.

Fox'd.

Fuddled.

Sore Footed.

Frozen.

Well in for't.

Owes no man a Farthing.

Fears no Man.

Crump Footed.

Been to France.

Flush'd.

Froze his Mouth.

Fetter'd.

Been to a Funeral.

His Flag is out.

He's Fuzl'd.

Spoke with his Friend.

Been at an Indian Feast.

G.

He's Glad.

Groatable.

Gold-headed.

Glaiz'd.

Generous.

Booz'd the Gage.

As Dizzy as a Gooze.

Been before George.

Got the Gout.

Had a Kick in the Guts.

Been with Sir John Goa,

Been at Geneva,

He's Globular.

Got the Glanders.

H.

He's Half and Half.

Hardy.

Top Heavy.

Got by the Head.

Hiddey.

Got on his little Hat.

Hammerish.

Loose in the Hilt.

Knows not the way Home.

Got the Hornson.

Haunted with Evil Spirits.

Has taken Hippocrates' Grand
Elixir.

I.

He's Intoxicated.

J.

He's Jolly.

Jagg'd

Jambl'd.

Going to Jerusalem.

Jocular.

Been to Jerico.

Juicy.

K.

He's a King.

Clips the King's English.

Seen the French King.

The King is his Cousin.

Got Kib'd Heels.

Knapt.

Het his Kettle,

L.

He's in Liquor.
 Lordly.
 He makes Indentures with
 his Leggs.
 Well to Live.
 Light.
 Lappy.
 Limber.

M.

He sees two Moons.
 Merry.
 Middling.
 Moon-eyed.
 Muddled.
 Seen a Flock of Moons.
 Maudlin.
 Mountous.
 Muddy.
 Rais'd his Monuments.
 Mellow.

N.

He's Eat the Cocoa Nut.
 Nimptopsical.
 Got the Night Mare.

O.

He's Oiled.
 Eat Opium.
 Smelt of an Onion.
 Oxyrocium.
 Overset.

P.

He drank till he gave up his
 Half Penny.

He's Pidgeon Ey'd.

Pungey.
 Priddy.
 As good conditioned as a
 Puppy.
 Has Scalt his Head Pan.
 Been among the Philistines.
 In his Prosperity.
 He's been among the Philippi-
 ans.
 contending with Pharaoh.
 Wasted his Paunch.
 Polite.
 Eats a Pudding Bag.

Q.

He's Quarrelsome.

R.

He's Rocky.
 Raddled.
 Rich.
 Religious.
 Lost his Rudder.
 Ragged.
 Rais'd.
 Been too free with Sir
 Richard.
 Like a Rat in Trouble.

S.

He's Stitch'd.
 Seafaring.
 In the Sudds.
 Strong.
 Been in the Sun.
 as Drunk as David's Sow.
 Swampy.

His Skin is full.	He's Tongue-ty'd.
He's Steady.	Tann'd.
Stiff.	Tipium Grove.
burnt his Shoulder.	Double Tongu'd.
got his Top Gallant Sails	Topsy-Turvey.
out.	Tipsey.
Seen the yellow Star.	swalloweda Tavern Token.
As Stiff as a Ringbolt.	Thaw'd.
Half Seas over.	in a Trance.
His Shoe pinches him.	Trammel'd.
He's Staggerish.	
It is Star-light with him.	V.
He carries too much Sail.	
He's Stew'd.	He makes Virginia Fence.
Stubb'd.	Valiant.
Soak'd.	Got the Indian Vapours.
Soft.	
Been too free with Sir	W.
John Strawberry.	
right before the wind with	The Malt is above the Water.
all his Studding Sails	He's Wise.
out.	Wet.
Has sold his Senses.	been to the Salt Water.
	Water Soaken.
T.	very Weary.
He's Top'd.	Out of the Way.

 XL.

ON SCANDAL.

MR. GAZETTEER :

I was highly pleased with your last week's paper upon SCANDAL, as the uncommon doctrine therein preached is agreeable both to my principles and practice, and as it was published very seasonably to re-

prove the impertinence of a writer in the foregoing Thursday's *Mercury*, who, at the conclusion of one of his silly paragraphs, laments forsooth, that the fair sex are so peculiarly guilty of this enormous crime. Every blockhead, ancient and modern, that could handle a pen, has, I think, taken upon him to cant in the same senseless strain. If to *scandalize* be really a crime, what do these puppies mean? They describe it, they dress it up in the most odious, frightful, and detestable colors, they represent it as the worst of crimes, and then roundly and charitably charge the whole race of womankind with it. Are not they then guilty of what they condemn, at the same time that they condemn it? If they accuse us of any other crime, they must necessarily scandalize while they do it; but to scandalize us with being guilty of scandal, is in itself an egregious absurdity, and can proceed from nothing but the most consummate impudence in conjunction with the most profound stupidity.

This supposing, as they do, that to scandalize is a crime, you have convinced all reasonable people is an opinion absolutely erroneous. Let us leave, then, these select mock-moralists, while I entertain you with some account of my life and manners.

I am a young girl of about thirty-five, and live at present with my mother. I have no care upon my head of getting a living, and therefore find it my duty, as well as inclination, to exercise my talent at *censure*, for the good of my country-folks. There was, I am told, a certain generous emperor, who, if a day had passed over his head in which he had conferred no

benefit on any man, used to say to his friends, in Latin, *diem perdididi*, that is, it seems, *I have lost a day*. I believe I should make use of the same expression, if it were possible for a day to pass in which I had not, or missed, an opportunity to scandalize somebody ; but, thanks be praised, no such misfortune has befallen me these dozen years.

Yet, whatever good I may do, I cannot pretend that I at first entered into the practice of this virtue from a principle of public spirit ; for I remember that, when a child, I had a violent inclination to be ever talking in my own praise ; and being continually told that it was ill manners, and once severely whipped for it, the confined stream formed for itself a new channel, and I began to speak for the future in the dispraise of others. This I found more agreeable to company, and almost as much so to myself ; for what great difference can there be between putting yourself up, or putting your neighbour down ? *Scandal*, like other virtues, is in part its own reward, as it gives us the satisfaction of making ourselves appear better than others, or others no better than ourselves.

My mother, good woman, and I, have heretofore differed upon this account. She argued, that scandal spoilt all good conversation ; and I insisted that without it there would be no such thing. Our disputes once rose so high that we parted tea-tables, and I concluded to entertain my acquaintance in the kitchen. The first day of this separation we both drank tea at the same time, but she with her visitors in the parlour. She would not hear of the least objection to any one's character,

but began a new sort of discourse in some such queer philosophical manner as this : “ I am mightily pleased sometimes,” says she, “ when I observe and consider that the world is not so bad as people out of humor imagine it to be. There is something amiable, some good quality or other, in every body. If we were only to speak of people that are least respected, there is such a one is very dutiful to her father, and me-thinks has a fine set of teeth ; such a one is very respectful to her husband ; such a one is very kind to her poor neighbours, and, besides, has a very handsome shape ; such a one is always ready to serve a friend, and, in my opinion, there is not a woman in town that has a more agreeable air or gait.” This fine kind of talk, which lasted near half an hour, she concluded by saying, “ I do not doubt but every one of you has made the like observations, and I should be glad to have the conversation continued upon this subject.” Just at this juncture I peeped in at the door, and never in my life before saw such a set of simple, vacant countenances. They looked somehow neither glad nor sorry, nor angry nor pleased, nor indifferent nor attentive ; but (excuse the simile) like so many images of rye-dough. I, in the kitchen, had already begun a ridiculous story of Mr. ——’s intrigue with his maid, and his wife’s behaviour on the discovery ; at some of the passages we laughed heartily ; and one of the gravest of mamma’s company, without making any answer to her discourse, got up *to go and see what the girls were so merry about*. She was followed by a second, and shortly by

a third, till at last the old gentlewoman found herself quite alone, and being convinced that her project was impracticable, came herself and finished her tea with us; ever since which *Saul also has been among the prophets*, and our disputes lie dormant.

By industry and application I have made myself the centre of all the scandal in the province. There is little stirring, but I hear of it. I began the world with this maxim, that no trade can subsist without returns, and, accordingly, whenever I received a good story, I endeavoured to give two or a better in the room of it. My punctuality in this way of dealing gave such encouragement, that it has procured me an incredible deal of business, which, without diligence and good method, it would be impossible for me to go through. For, besides the stock of defamation thus naturally flowing in upon me, I practise an art by which I can pump scandal out of people that are the least inclined that way. Shall I discover my secret? Yes; to let it die with me would be inhuman. If I have never heard ill of some person, I always impute it to defective intelligence; *for there are none without their faults; no, not one*. If she be a woman, I take the first opportunity to let all her acquaintance know I have heard that one of the handsomest or best men in town has said something in praise either of her beauty, her wit, her virtue, or her good management. If you know any thing of human nature, you perceive that this naturally introduces a conversation turning upon all her failings, past, present, and to come. To the same purpose,

and with the same success, I cause every man of reputation to be praised before his competitors in love, business, or esteem, on account of any particular qualification. Near the times of election, if I find it necessary, I commend every candidate before some of the opposite party, listening attentively to what is said of him in answer. But commendations in this latter case are not always necessary, and should be used judiciously. Of late years I needed only observe what they said of one another freely; and having, for the help of memory, taken account of all informations and accusations received, whoever peruses my writings after my death may happen to think that during a certain time the people of Pennsylvania chose into all their offices of honor and trust the veriest knaves, fools, and rascals in the whole province. The time of election used to be a busy time with me; but this year, with concern I speak it, people are grown so good-natured, so intent upon mutual feasting and friendly entertainment, that I see no prospect of much employment from that quarter.

I mentioned above, that without good method I could not go through my business. In my father's lifetime I had some instruction in accounts, which I now apply with advantage to my own affairs. I keep a regular set of books, and can tell, at an hour's warning, how it stands between me and the world. In my *Daybook* I enter every article of defamation as it is transacted; for scandals *received in* I give credit, and when I pay them out again I make the persons to

whom they respectively relate *debtor*. In my *Journal* I add to each story, by way of improvement, such probable circumstances as I think it will bear ; and in my *Ledger* the whole is regularly posted.

I suppose the reader already condemns me in his heart for this particular of *adding circumstances* ; but I justify this part of my practice thus. It is a principle with me, that none ought to have a greater share of reputation than they really deserve ; if they have, it is an imposition upon the public. I know it is every one's interest, and therefore believe they endeavour to conceal all their vices and follies ; and I hold that those people are *extraordinary* foolish or careless, who suffer one fourth of their failings to come to public knowledge. Taking then the common prudence and imprudence of mankind in a lump, I suppose none suffer above one fifth to be discovered ; therefore, when I hear of any person's misdoing, I think I keep within bounds if in relating it I only make it three times worse than it is ; and I reserve to myself the privilege of charging them with one fault in four, which for aught I know they may be entirely innocent of. You see, there are but few so careful of doing justice as myself. What reason then have mankind to complain of *scandal* ? In a general way the worst that is said of us is only half what might be said, if all our faults were seen.

But, alas ! two great evils have lately befallen me at the same time : an extreme cold, that I can scarce speak ; and a most terrible tooth-ache, that I dare hardly open my mouth. For some days past I have

received ten stories for one I have paid ; and I am not able to balance my accounts without your assistance. I have long thought that if you would make your paper a vehicle of scandal, you would double the number of your subscribers. I send you herewith accounts of four knavish tricks, two * * *, five * * * *, three drubbed wives, and four henpecked husbands, all within this fortnight ; which you may, as articles of news, deliver to the public, and, if my tooth-ache continues, I shall send you more, being in the mean time your constant reader,

ALICE ADDERTONGUE.

I thank my correspondent, Mrs. Addertongue, for her good will, but desire to be excused inserting the articles of news she has sent me, such things being in reality no news at all.

XLI.

A CASE OF CASUISTRY.

TO THE PRINTER OF THE GAZETTE.

According to the request of your correspondent, T. P., I send you my thoughts on the following case by him proposed, viz.:

A man bargains for the keeping of his horse six months, whilst he is making a voyage to Barbadoes. The horse strays or is stolen soon after the keeper has him in possession. When the owner demands

the value of his horse in money, may not the other as justly demand so much deducted as the keeping of the horse six months amounts to ?

It does not appear that they had any dispute about the value of the horse, whence we may conclude there was no reason for such dispute, but it was well known how much he cost, and that he could not honestly have been sold again for more. But the value of the horse is not expressed in the case, nor the sum agreed for keeping him six months ; wherefore, in order to our more clear apprehension of the thing, let *ten pounds* represent the horse's value, and *three pounds* the sum agreed upon for his keeping.

Now the sole foundation on which the keeper can found his demand of a deduction for keeping a horse he did not keep, is this : "Your horse," he may say, "which I was to restore to you at the end of six months, was worth ten pounds ; if I now give you ten pounds, it is an equivalent for your horse, and equal to returning the horse itself. Had I returned your horse (value ten pounds), you would have paid me three pounds for his keeping, and therefore would have received in fact, but seven pounds clear. You then suffer no injury, if I now pay you seven pounds, and consequently you ought in reason to allow me the remaining three pounds, according to our agreement.

But the owner of the horse may possibly insist upon being paid the whole sum of ten pounds, with-

out allowing any deduction for his keeping after he was lost, and that for these reasons :

1. It is always supposed, unless an express agreement be made to the contrary, when horses are put out to keep, that the keeper is at the risk of them, unavoidable accidents only excepted, wherein no care of the keeper can be supposed sufficient to preserve them, such as their being slain by lightning or the like. This you yourself tacitly allow when you offer to restore me the value of my horse. Were it otherwise, people, having no security against a keeper's neglect or mismanagement, would never put horses out to keep.

2. Keepers, considering the risk they run, always demand such a price for keeping horses that, if they were to follow the business twenty years, they may have a living profit, though they now and then pay for a horse they have lost ; and if they were to be at no risk they might afford to keep horses for less than they usually have. So that what a man pays for his horse's keeping, more than the keeper could afford to take if he ran no risk, is in the nature of a premium for the insurance of his horse. If I then pay you for the few days you kept my horse, you should restore me his full value.

3. You acknowledge that my horse eat of your hay and oats but a few days. It is unjust, then, to charge me for all the hay and oats that he only might have eat in the remainder of the six months, and which you have now still good in your stable. If, as the proverb says, it is unreasonable to expect a horse

should void oats, which never eat any, it is certainly as unreasonable to expect payment for those oats.

4. If men in such cases as this are to be paid for keeping horses when they were not kept, then they have a great opportunity of wronging the owners of horses. For by privately selling my horse for his value (ten pounds) soon after you had him in possession, and returning me, at the expiration of the time, only seven pounds, demanding three pounds as a deduction agreed for his keeping, you get that three pounds clear into your pocket, besides the use of my money six months for nothing.

5. But, you say, the value of my horse being ten pounds, if you deduct three for his keeping and return me seven, it is all I would in fact have received had you returned my horse ; therefore, as I am no loser, I ought to be satisfied. This argument, were there any weight in it, might serve to justify a man in selling, as above, as many of the horses he takes to keep as he conveniently can, putting clear into his own pocket that charge their owners must have been at for their keeping ; for, this being no loss to the owners, he may say : “ Where no man is a loser, why should not I be a gainer ? ” I need only answer to this, that I allow the horse cost me but ten pounds, nor could I have sold him for more had I been disposed to part with him ; but this can be no reason why you should buy him of me at that price, whether I will sell him or not. For it is plain I valued him at thirteen pounds, otherwise I should not have paid ten pounds for him, and agreed to give you three pounds

more for his keeping till I had occasion to use him. Thus, though you pay me the whole ten pounds which he cost me (deducting only for his keeping those few days), I am still a loser : I lose the charge of those days' keeping ; I lose the three pounds at which I valued him above what he cost me ; and I lose the advantage I might have made of my money in six months, either by the interest, or by joining it to my stock in trade in my voyage to Barbadoes.

6. Lastly, whenever a horse is put to keep, the agreement naturally runs thus : The keeper says : " I will feed your horse six months on good hay and oats, if, at the end of that time, you pay me three pounds." The owner says : " If you will feed my horse six months on good hay and oats, I will pay you three pounds at the end of that time." Now we may plainly see the keeper's performance of his part of the agreement must be antecedent to that of the owner ; and, the agreement being wholly conditional, the owner's part is not in force till the keeper has performed his. You, then, not having fed my horse six months, as you agreed to do, there lies no obligation on me to pay for so much feeding.

Thus we have heard what can be said on both sides. Upon the whole, I am of opinion that no deduction should be allowed for the keeping of the horse after the time of his straying.

I am yours, &c.,

THE CASUIST.

XLII.
PLAIN TRUTH ;

OR,

SERIOUS CONSIDERATIONS

ON

THE PRESENT STATE OF THE CITY OF PHILADELPHIA AND
PROVINCE OF PENNSYLVANIA.

BY A TRADESMAN OF PHILADELPHIA.

Captâ urbe, nihil fit reliqui victis. Sed, per deos immortales, vos ego appello, qui semper domos, villas, signa, tabulas vestras, [tantæ æstimationis] fecistis ; si ista, cujuscumque modi sint, quæ amplexamini, retinere, si voluptatibus vestris otium præbere vultis ; expergiscimini aliquando, et capessite rempublicam. Non agitur [nunc] de sociorum injuriis ; *libertas et anima* nostra in dubio est. Dux hostium cum exercitu supra caput est. Vos cunctamini etiam nunc, et dubitatis quid faciatis ? Scilicet res ipsa aspera est, sed vos non timetis eam. Imo vero maxime ; sed inertia et mollitia animi, alius alium expectantes, cunctamini ; videlicet diis immortalibus confisi, qui hanc rempublicam in maximis sæpe periculis servavere. *Non votis neque suppliciis muliebribus, auxilia deorum parantur* ; vigilando, agendo, bene consulendo, prospere omnia cedunt. Ubi socordiae te atque ignaviae tradideris, nequicquam deos implores ; irati infestique sunt.—*M. por. Cato, in Sallust.*

“ Translation.

“ Should the city be taken, all will be lost to the conquered. Therefore, if you desire to preserve your buildings, houses, and country-seats, your statues, paintings, and all your other possessions, which you so highly esteem ; if you wish to continue in the enjoyment of them, or to have leisure for any future pleasures, I beseech you by the immortal Gods, rouse at last, awake from your lethargy, and save the commonwealth. It is not the trifling

concern of injuries from your allies that demands your attention ; your liberties, lives, and fortunes, with every thing that is interesting and dear to you, are in the most imminent danger. Can you doubt of or delay what you ought to do, now, when the enemy's swords are unsheathed, and descending on your heads ? The affair is shocking and horrid ! Yet, perhaps, you are not afraid. Yes, you are terrified to the highest degree. But through indolence and supineness of soul, gazing at each other, to see who shall first rise to your succor ; and a presumptuous dependence on the immortal Gods, who indeed have preserved this republic in many dangerous seasons ; you delay and neglect every thing necessary for your preservation. Be not deceived ; Divine assistance and protection are not to be obtained by timorous prayers and womanish supplications. To succeed, you must join salutary counsels, vigilance, and courageous actions. If you sink into effeminacy and cowardice ; if you desert the tender and helpless, by Providence committed to your charge, never presume to implore the Gods ; it will provoke them, and raise their indignation against you."¹

It is said the wise Italians make this proverbial remark on our nation, viz.: "The English *feel* but they do not *see*." That is, they are sensible of in-

¹ The first edition of this pamphlet seems to be out of print. The second, at the close of which first appeared the foregoing translation, was printed in 1747. The publication was provoked by the defenceless condition of the colony at that time, exposed as it was to Spain on the south and to France on the west, with both of which nations Great Britain was then at war ; to say nothing of the Indians, who, like the poor, they had always with them. The efforts to induce the Quaker Assembly of Pennsylvania to pass a militia law, and make other provisions for the security of the province, having proved abortive, Franklin proposed to try what might be done by a voluntary subscription of the people. "To promote this," he says in his Autobiography, "I first wrote and

published a pamphlet entitled 'Plain Truth.'" Its success was extraordinary (see Autobiography, vol. i., p. 213). An answer to it, entitled "Necessary Truth," and enforcing the Quaker doctrine of non-resistance, was published in 1748. It came too late to impair, if it ever could have impaired, the impression left upon the colony by "Plain Truth."

Substituting the words "United States" for "Pennsylvania," this pamphlet is as timely to-day as when it was written. Though we are at peace with all nations, we have many times as many lives, and many times as much property exposed, while our defences are relatively inferior to those which Franklin denounced nearly a century and a half ago as inexcusably deficient.

conveniences when they are present, but do not take sufficient care to prevent them ; their natural courage makes them too little apprehensive of danger, so that they are often surprised by it, unprovided of the proper means of security. When it is too late they are sensible of their imprudence ; after great fires they provide buckets and engines ; after a pestilence they think of keeping clean their streets and common sewers ; and when a town has been sacked by their enemies, they provide for its defence, &c. This kind of after-wisdom is indeed so common with us as to occasion the vulgar though very significant saying, *When the steed is stolen you shut the stable door.*

But the more insensible we generally are of public danger and indifferent when warned of it, so much the more freely, openly, and earnestly ought such as apprehend it, to speak their sentiments, that, if possible, those who seem to sleep, may be awakened to think of some means of avoiding or preventing the mischief before it be too late.

Believing, therefore, that it is my *duty*, I shall honestly speak my mind in the following paper.

War at this time rages over a great part of the known world ; our newspapers are weekly filled with fresh accounts of the destruction it everywhere occasions. Pennsylvania, indeed, situate in the centre of the colonies, has hitherto enjoyed profound repose ; and though our nation is engaged in a bloody war with two great and powerful kingdoms, yet, defended in a great degree from the French on the one hand,

by the northern provinces, and from the Spaniards on the other, by the southern, at no small expense to each, our people have till lately slept securely in their habitations.

There is no British colony, excepting this, but has made some kind of provision for its defence ; many of them have therefore never been attempted by an enemy ; and others that were attacked have generally defended themselves with success. The length and difficulty of our bay and river have been thought so effectual a security to us, that hitherto no means have been entered into that might discourage an attempt upon us or prevent its succeeding.

But whatever security this might have been while both country and city were poor, and the advantage to be expected scarce worth the hazard of an attempt, it is now doubted whether we can any longer safely depend upon it. Our wealth, of late years much increased, is one strong temptation, our defenceless state another, to induce an enemy to attack us ; while the acquaintance they have lately gained with our bay and river, by means of the prisoners and flags of truce they have had among us, by spies which they almost everywhere maintain, and perhaps from traitors among ourselves ; with the facility of getting pilots to conduct them ; and the known absence of ships of war during the greatest part of the year from both Virginia and New York ever since the war began, render the appearance of success to the enemy far more promising, and therefore highly increase our danger.

That our enemies may have spies abroad, and some

even in these colonies, will not be made much doubt of, when it is considered that such has been the practice of all nations in all ages, whenever they were engaged, or intended to engage, in war. Of this we have an early example in the Book of Judges (too pertinent to our case, and therefore I must beg leave a little to enlarge upon it), where we are told (Chap. xviii. v. 2,) that *the children of Dan sent of their family five men from their coasts to spy out the land, and search it, saying, Go, search the land.* These Danites, it seems, were at this time not very orthodox in their religion, and their spies met with a certain idolatrous priest of their own persuasion (v. 3), and they said to him, *Who brought thee hither? What makest thou in this place? And what hast thou here?* [Would to God no such priests were to be found among us.] *And they said unto him (v. 5), Ask counsel of God, that we may know whether our way which we go shall be prosperous; and the priest said unto them, Go in peace; before the Lord is your way wherein you go.* [Are there no priests among us, think you, that might, in the like case, give an enemy as good encouragement? It is well known that we have numbers of the same religion with those who of late encouraged the French to invade our mother country.] *And they came (v. 7), to Laish, and saw the people that were therein, how they dwelt CARELESS, after the manner of the Zidonians, QUIET, and SECURE.* They thought themselves secure, no doubt; and as they never had been disturbed, vainly imagined they never should be. It is not unlikely that some might see the

danger they were exposed to by living in that *careless* manner; but that, if these publicly expressed their apprehensions, the rest reproached them as timorous persons, wanting courage or confidence in their gods, who (they might say) had hitherto protected them. But the spies (v. 8) returned, and said to their countrymen (v. 9): *Arise, that we may go up against them; for we have seen the land, and behold it is very good. And are ye still? Be not slothful to go.* (Verse 10): *When ye go, ye shall come to a people SECURE* [that is, a people that apprehend no danger, and therefore have made no provision against it; great encouragement this!], *and to a large land, and a place where there is no want of any thing.* What could they desire more? Accordingly, we find in the following verses that *six hundred men only, appointed with weapons of war*, undertook the conquest of this *large land*; knowing that six hundred men, armed and disciplined, would be an overmatch perhaps for sixty thousand unarmed, undisciplined, and off their guard. And when they went against it, the idolatrous priest (v. 17), *with his graven image, and his ephod, and his teraphim, and his molten image* (plenty of superstitious trinkets), joined with them, and, no doubt, gave them all the intelligence and assistance in his power; his heart, as the text assures us, *being glad*, perhaps for reasons more than one. And, now, what was the fate of poor Laish? The six hundred men being arrived, found, as the spies had reported, a people QUIET and SECURE (vv. 27, 28). *And they smote them with the edge of the sword, and burnt the city with*

FIRE ; and *there was no DELIVERER, because it was far from Zidon.*—Not so far from Zidon, however, as Pennsylvania is from Britain ; and yet we are, if possible, more careless than the people of Laish ! As the Scriptures are given for our reproof, instruction, and warning, may we make a due use of this example before it be too late !

And is our country, any more than our city, altogether free from danger ? Perhaps not. We have, it is true, had a long peace with the Indians ; but it is a long peace indeed, as well as a long lane, that has no ending. The French know the power and importance of the Six Nations, and spare no artifice, pains, or expense to gain them to their interest. By their priests they have converted many to their religion, and these ¹ have openly espoused their cause. The rest appear irresolute what part to take ; no persuasions, though enforced with costly presents, having yet been able to engage them generally on our side, though we had numerous forces on their borders ready to second and support them. What then may be expected, now those forces are, by orders from the crown, to be disbanded ; when our boasted expedition is laid aside through want (as it may appear to them) either of strength or courage ; when they see that the French and their Indians boldly and with impunity ravage the frontiers of New York, and scalp the inhabitants ; when those few Indians that engaged with us against the French are left exposed to their resentment ? When they consider these things, is there no

¹ The Praying Indians.

danger, through disgust at our usage, joined with fear of the French power, and greater confidence in their promises and protection than in ours, they may be wholly gained over by our enemies, and join in the war against us? If such should be the case, which God forbid, how soon may the mischief spread to our frontier counties? And what may we expect to be the consequence, but desertion of plantations, ruin, bloodshed, and confusion?

Perhaps some in the city, towns, and plantations near the river may say to themselves: "An Indian war on the frontiers will not affect us; the enemy will never come near our habitations; let those concerned take care of themselves." And others who live in the country, when they are told of the danger the city is in from attempts by sea, may say: "What is that to us? The enemy will be satisfied with the plunder of the town, and never think it worth his while to visit our plantations; let the town take care of itself." These are not mere suppositions, for I have heard some talk in this strange manner. But are these the sentiments of true Pennsylvanians, of fellow-countrymen, or even of men that have common-sense or goodness? Is not the whole province one body, united by living under the same laws and enjoying the same privileges? Are not the people of city and country connected as relations, both by blood and marriage, and in friendships equally dear? Are they not likewise united in interest, and mutually useful and necessary to each other? When the feet are wounded, shall the head say: "It is not I; I will

not trouble myself to contrive relief !” Or if the head is in danger, shall the hands say : “ We are not affected, and therefore will lend no assistance !” No. For so would the body be easily destroyed ; but when all parts join their endeavours for its security, it is often preserved. And such should be the union between the country and the town ; and such their mutual endeavours for the safety of the whole. When New England, a distant colony, involved itself in a greivous debt to reduce Cape Breton, we freely gave four thousand pounds for *her* relief. And at another time, remembering that Great Britain, still more distant, groaned under heavy taxes in supporting the war, we threw in our mite to her assistance, by a free gift of three thousand pounds ; and shall country and town join in helping strangers (as those comparatively are), and yet refuse to assist each other ?

But whatever different opinions we have of our security in other respects, our TRADE, all seem to agree, is in danger of being ruined in another year. The great success of our enemies, in two different cruises this last summer in our bay, must give them the greatest encouragement to repeat more frequently their visits, the profit being almost certain, and the risk next to nothing. Will not the first effect of this be an enhancing of the price of all foreign goods to the tradesman and farmer who use or consume them ? For the rate of insurance will increase in proportion to the hazard of importing them ; and in the same proportion will the price of those goods increase. If

the price of the tradesman's work and the farmer's produce would increase equally with the price of foreign commodities, the damage would not be so great ; but the direct contrary must happen. For the same hazard or rate of insurance that raises the price of what is imported, must be deducted out of and lower the price of what is exported. Without this addition and deduction, as long as the enemy cruise at our capes, and take those vessels that attempt to *go out*, as well as those that endeavour to *come in*, none can afford to trade, and business must be soon at a stand. And will not the consequences be a discouragement of many of the vessels that used to come from other places to purchase our produce, and thereby a turning of the trade to ports that can be entered with less danger, and capable of furnishing them with the same commodities as New York, &c.; a lessening of business to every shopkeeper, together with multitudes of bad debts, the high rate of goods discouraging the buyers, and the low rates of their labor and produce rendering them unable to pay for what they had bought ; loss of employment to the tradesman, and bad pay for what little he does ; and, lastly, loss of many inhabitants, who will retire to other provinces not subject to the like inconveniences ; whence a lowering of the value of lands, lots, and houses ?

The enemy, no doubt, have been told that the people of Pennsylvania are Quakers, and against all defence, from a principle of conscience. This, though true of a part, and that a small part only, of the inhabitants, is commonly said of the whole ; and what

may make it look probable to strangers is that, in fact, nothing is done by any part of the people towards their defence. But to refuse defending one's self, or one's country, is so unusual a thing among mankind, that possibly they may not believe it till, by experience, they find they can come higher and higher up our river, seize our vessels, land and plunder our plantations and villages, and retire with their booty unmolested. Will not this confirm the report, and give them the greatest encouragement to strike one bold stroke for the city and for the whole plunder of the river?

It is said by some that the expense of a vessel to guard our trade would be very heavy, greater than perhaps all the enemy can be supposed to take from us at sea would amount to, and that it would be cheaper for the government to open an insurance office and pay all losses. But is this right reasoning? I think not; for what the enemy takes is clear loss to us and gain to him, increasing his riches and strength as much as it diminishes ours, so making the difference double; whereas the money paid our own tradesmen for building and fitting out a vessel of defence remains in the country and circulates among us; what is paid to the officers and seamen that navigate her is also spent ashore, and soon gets into other hands; the farmer receives the money for her provisions, and, on the whole, nothing is clearly lost to the country but her wear and tear, or so much as she sells for at the end of the war less than her first cost. This loss, and a trifling one it is, is all the inconven-

ience ; but how many and how great are the conveniences and advantages ! And should the enemy, through our supineness and neglect to provide for the defence both of our trade and country, be encouraged to attempt this city, and, after plundering us of our goods, either burn it or put it to ransom, how great would that loss be, besides the confusion, terror, and distress so many hundreds of families would be involved in !

The thought of this latter circumstance so much affects me that I cannot forbear expatiating somewhat more upon it. You have, my dear countrymen and fellow-citizens, riches to tempt a considerable force to unite and attack you, but are under no ties or engagements to unite for your defence. Hence, on the first alarm, terror will spread over all ; and as no man can with certainty depend that another will stand by him, beyond doubt very many will seek safety by a speedy flight. Those that are reputed rich will flee through fear of torture to make them produce more than they are able. The man that has a wife and children will find them hanging on his neck, beseeching him with tears to quit the city and save his life, to guide and protect them in that time of general desolation and ruin. All will run into confusion, amidst cries and lamentations, and the hurry and disorder of departers carrying away their effects. The few that remain will be unable to resist. Sacking the city will be the first, and burning it, in all probability, the last act of the enemy. This, I believe, will be the case if you have timely notice. But

what must be your condition, if suddenly surprised, without previous alarm, perhaps in the night ! Confined to your houses, you will have nothing to trust to but the enemy's mercy. Your best fortune will be to fall under the power of commanders of king's ships able to control the mariners, and not into the hands of *licentious privateers*. Who can, without the utmost horror, conceive the miseries from the latter, when your persons, fortunes, wives, and daughters shall be subject to the wanton and unbridled rage, rapine, and lust of negroes, mulattoes, and others, the vilest and most abandoned of mankind.¹ A dreadful scene ! which some may represent as exaggerated. I think it my duty to warn you ; judge for yourselves.

It is true, with very little notice the rich may shift for themselves. The means of speedy flight are ready in their hands ; and with some previous care to lodge money and effects in distant and secure places, though they should lose much, yet enough may be left them, and to spare. But most unhappily circumstanced indeed are we, the middling people, the tradesmen, shopkeepers, and farmers of the province and city ! We cannot all fly with our families ; and if we could, how shall we subsist ? No ; we and they, and what little we have gained by hard labor and industry, must bear the brunt ; the weight of contribu-

¹ By accounts, the ragged crew of the Spanish privateer that plundered Mr. Liston's and another plantation, a little below Newcastle, was composed of such as these. The *honor* and *humanity* of their officers may be judged of by the treatment they gave poor Captain Brown, whom they took with

Martin's ship in returning from their cruise. Because he bravely defended himself and vessel longer than they expected, for which every generous enemy would have esteemed him, did they, after he had struck and submitted, barbarously *stab* and *murder* him, though on his knees, begging quarter !

tions extorted by the enemy (as it is of taxes among ourselves) must be surely borne by us. Nor can it be avoided, as we stand at present; for though we are numerous we are quite defenceless, having neither forts, arms, union, nor discipline. And though it were true that our trade might be protected at no great expense, and our country and our city easily defended, if proper measures were but taken, yet who shall take these measures? Who shall pay that expense? On whom may we fix our eyes with the least expectation that they will do any thing for our security? Should we address that wealthy and powerful body of people who have ever since the war governed our elections and filled almost every seat in our Assembly;—should we entreat them to consider, if not as friends, at least as legislators, that *protection* is as truly due from the government to the people, as *obedience* from the people to the government; and that if, on account of their religious scruples, they themselves could do no act for our defence, yet they might retire, relinquish their power for a season, quit the helm to freer hands during the present tempest—to hands, chosen by their own interest too, whose prudence and moderation, with regard to them, they might safely confide in, secure, from their own native strength, of resuming again their present station whenever it shall please them;—should we remind them, that the public money, raised *from all*, belongs *to all*; that since they have, for their own ease, and to secure themselves in the quiet enjoyment of their religious prin-

ciples (and may they long enjoy them), expended such large sums to oppose petitions, and engage favorable representations of their conduct, if they themselves could by no means be free to appropriate any part of the public money for our defence, yet it would be no more than justice to spare us a reasonable sum for that purpose, which they might easily give to the King's use as heretofore, leaving all the appropriation to others, who would faithfully apply it as we desired;—should we tell them, that, though the treasury be at present empty, it may soon be filled by the outstanding public debts collected, or at least credit might be had for such a sum, on a single vote of the Assembly; that though *they* themselves may be resigned and easy under this naked, defenceless state of the country, it is far otherwise with a very great part of the people,—with *us*, who can have no confidence that God will protect those that neglect the use of rational means for their security, nor have any reason to hope that our losses, if we should suffer any, may be made up by collections in our favor at home;—should we conjure them by all the ties of neighbourhood, friendship, justice, and humanity to consider these things; and what distraction, misery, and confusion, what desolation and distress, may possibly be the effect of their *unseasonable* predominancy and perseverance:—yet all would be in vain; for they have already been, by great numbers of the people, petitioned in vain. Our late Governor did for years solicit, request, and even threaten them in vain. The Council have since

twice remonstrated to them in vain. Their religious prepossessions are unchangeable, their obstinacy invincible. Is there, then, the least hope remaining, that from that quarter any thing should arise for our security?

And is our prospect better, if we turn our eyes to the strength of the opposite party, those great and rich men, merchants and others, who are ever railing at Quakers for doing what their principles seem to require, and what in charity we ought to believe they think their duty, but take no one step themselves for the public safety? They have so much wealth and influence, if they would use it, that they might easily, by their endeavours and example, raise a military spirit among us, make us fond, studious of, and expert in, martial discipline, and effect every thing that is necessary, under God, for our protection. But *envy* seems to have taken possession of their hearts, and to have eaten out and destroyed every generous, noble, public-spirited sentiment. *Rage*, at the disappointment of their little schemes for power, gnaws their souls, and fills them with such cordial hatred to their opponents, that every proposal, by the execution of which *those* may receive benefit as well as themselves, is rejected with indignation. "What," they say, "shall we lay out our money to protect the trade of Quakers? Shall we fight to defend Quakers? No; let the trade perish, and the city burn; let what will happen, we shall never lift a finger to prevent it." Yet the Quakers have *conscience* to plead for their resolution not to fight, which

these gentlemen have not. Conscience with you, gentlemen, is on the other side of the question ; conscience enjoins it as a *duty* on you (and, indeed, I think it such on every man) to defend your country, your friends, your aged parents, your wives, and helpless children ; and yet you resolve not to perform this duty, but act contrary to your own consciences, because the Quakers act according to theirs. Till of late, I could scarce believe the story of him who refused to pump in a sinking ship, because one on board, whom he hated, would be saved by it as well as himself. But such, it seems, is the unhappiness of human nature, that our passions, when violent, often are too hard for the united force of reason, duty, and religion.

Thus unfortunately are we circumstanced at this time, my dear countrymen and fellow-citizens ; we, I mean, the middling people, the farmers, shopkeepers, and tradesmen of this city and country. Through the dissensions of our leaders, through mistaken principles of religion, joined with a love of worldly power, on the one hand ; through pride, envy, and implacable resentment on the other ; our lives, our families, and little fortunes, dear to us as any great man's can be to him, are to remain continually exposed to destruction from an enterprising, cruel, now well-informed, and by success, encouraged enemy. It seems as if Heaven, justly displeased at our growing wickedness, and determined to punish¹ this once-favored land,

¹ When God determined to punish his chosen people, the inhabitants of Jerusalem, who, though breakers of

his other laws, were scrupulous observers of that ONE, which required keeping holy the Sabbath-day, he suf-

had suffered our chiefs to engage in these foolish and mischievous contentions for little posts and paltry distinctions, that our hands might be bound up, our understandings darkened and misled, and every means of our security neglected. It seems as if our greatest men, our *cives nobilissimi*¹ of both parties, had sworn the ruin of the country, and invited the French, our most inveterate enemy, to destroy it. Where then shall we seek for succour and protection? The government we are immediately under denies it to us; and if the enemy comes, we are *far from Zidon, and there is no deliverer near*. Our case is dangerously bad; but perhaps there is yet a remedy, if we have but the prudence and the spirit to apply it.

If this new, flourishing city and greatly improving colony is destroyed and ruined, it will not be for want of numbers of inhabitants able to bear arms in its defence. It is computed that we have at least (exclusive of the Quakers) sixty thousand fighting men, acquainted with firearms, many of them hunters and marksmen, hardy and bold. All we want is order, discipline, and a few cannon. At present we are like the separate filaments of flax before the thread is formed, without strength, because without connexion; but UNION would make us strong and even formidable, though the *great* should neither help nor join us; though they should even oppose our uniting, from

ferred even the strict observation of that command to be their ruin; for Pompey, observing that they then obstinately refused to fight, made a general assault on that day, took the town, and butchered them with as

little mercy as he found resistance.—JOSEPHUS.

¹ Conjuravere cives nobilissimi patriam incendere; GALLORUM GENTEM, infestissimam nomini Romano, ad bellum arcessunt.—CATO, in SALLUST.

some mean views of their own, yet, if we resolve upon it, and it pleases God to inspire us with the necessary prudence and vigor, it *may* be effected. Great numbers of our people are of British race ; and, though the fierce fighting animals of those happy Islands are said to abate their native fire and intrepidity when removed to a foreign clime, yet with the people it is not so ; our neighbours of New England afford the world a convincing proof that Britons, though a hundred years transplanted, and to the remotest part of the earth, may yet retain, even to the third and fourth descent, that zeal for the public good, that military prowess, and that undaunted spirit which has in every age distinguished their nation. What numbers have we likewise of *those brave people*, whose fathers in the last age made so glorious a stand for our religion and liberties, when invaded by a powerful French army, joined by Irish Catholics, under a bigoted Popish king ! Let the memorable siege of Londonderry, and the signal actions of the Iniskillingers, by which the heart of that Prince's schemes were broken, be perpetual testimonies of the courage and conduct of those noble warriors ! Nor are there wanting amongst us thousands of that warlike nation, whose sons have ever since the time of Cæsar maintained the character he gave their fathers, of joining the most obstinate courage to all the other military virtues,—I mean the brave and steady Germans, numbers of whom have actually borne arms in the service of their respective Princes ; and if they fought well for their tyrants and oppressors, would they refuse to unite

with us in defence of their newly acquired and most precious liberty and property? Were this union formed, were we once united, thoroughly armed and disciplined, was every thing in our power done for our security, as far as human means and foresight could provide, we might then, with more propriety, humbly ask the assistance of Heaven, and a blessing on our lawful endeavours. The very fame of our strength and readiness would be a means of discouraging our enemies; for it is a wise and true saying, that *one sword often keeps another in the scabbard*. The way to secure peace is to be prepared for war. They that are on their guard, and appear ready to receive their adversaries, are in much less danger of being attacked than the supine, secure, and negligent. We have yet a winter before us which may afford a good and almost sufficient opportunity for this, if we seize and improve it with a becoming vigor. And if the hints contained in this paper are so happy as to meet with a suitable disposition of mind in his countrymen and fellow-citizens, the writer of it will, in a few days, lay before them a form of ASSOCIATION for the purposes herein mentioned, together with a practicable scheme for raising the money necessary for the defence of our trade, city, and country, without laying a burthen on any man.

May the God of wisdom, strength, and power, the Lord of the armies of Israel, inspire us with prudence in this time of danger, take away from us all the seeds of contention and division, and unite the hearts and counsels of all of us, of whatever sect or nation,

in one bond of peace, brotherly love, and generous public spirit ; may he give us strength and resolution to amend our lives and remove from among us every thing that is displeasing to him, afford us his most gracious protection, confound the designs of our enemies, and give peace in all our borders, is the sincere prayer of
A TRADESMAN OF PHILADELPHIA.

XLIII.

TO PETER COLLINSON.

PHILADELPHIA, 28 March, 1747.

SIR :—Your kind present of an electric tube, with directions for using it, has put several of us on making electrical experiments, in which we have observed some particular phenomena that we look upon to be new. I shall therefore communicate them to you in my next, though possibly they may not be new to you, as among the numbers daily employed in those experiments on your side of the water, it is probable some one or other has hit upon the same observations. For my own part, I never was before engaged in any study that so totally engrossed my attention and my time, as this has lately done ; for what with making experiments when I can be alone, and repeating them to my friends and acquaintance, who, from the novelty of the thing, come continually in crowds to see them, I have, during some months past, had little leisure for any thing else.

I am, &c.,

B. FRANKLIN.

While on a visit to Boston, in 1746, Franklin witnessed some electrical experiments performed by a Mr. Spence, recently arrived from Scotland. Shortly after his return to Philadelphia the Library Company received from Mr. Collinson, of London, and a member of the Royal Society, a glass tube, with instructions for making experiments with it. With this tube Franklin began a course of experiments which resulted in discoveries which, humanly speaking, seem to be exerting a larger material influence upon the industries of the world than any other discovery of the human intellect. Dr. Stuber, then a resident of Philadelphia, and author of the first continuation of Franklin's life, who seems to have enjoyed peculiar opportunities of obtaining full and authentic information upon the subject, gives us the following account of the observations which this letter ought for the first time to the notice of the world through Mr. Collinson.

"His observations," says Dr. Stuber, "he communicated, in a series of letters, to his friend Collinson, the first of which is dated March 28th, 1747. In these he shows the power of points in drawing and throwing off the electrical matter, which had hitherto escaped the notice of electricians. He also made the grand discovery of a *plus* and *minus*, or of a *positive* and *negative* state of electricity. We give him the honor of this without hesitation; although the English have claimed it for their countryman, Dr. Watson. Watson's paper is dated January 21st, 1748; Franklin's, July 11th, 1747, several months prior. Shortly after Franklin, from his principles of the *plus* and *minus* state, explained in a satisfactory manner the phenomena of the Leyden phial, first observed by Mr. Cuneus, or by Professor Muschenbroeck, of Leyden, which had much perplexed philosophers. He showed clearly that when charged the bottle contained no more electricity than before, but that as much was taken from one side as was thrown on the other; and that to discharge it nothing was necessary but to produce a communication between the two

sides, by which the equilibrium might be restored, and that then no signs of electricity would remain. He afterwards demonstrated by experiments that the electricity did not reside in the coating, as had been supposed, but in the pores of the glass itself. After a phial was charged he removed the coating, and found that upon applying a new coating the shock might still be received. In the year 1749, he first suggested his idea of explaining the phenomena of thunder-gusts and of the *aurora borealis* upon electrical principles. He points out many particulars in which lightning and electricity agree; and he adduces many facts, and reasonings from facts, in support of his positions.

“In the same year he conceived the astonishingly bold and grand idea of ascertaining the truth of his doctrine by actually drawing down the lightning, by means of sharp-pointed iron rods raised into the region of the clouds. Even in this uncertain state, his passion to be useful to mankind displayed itself in a powerful manner. Admitting the identity of electricity and lightning, and knowing the power of points in repelling bodies charged with electricity, and in conducting their fires silently and imperceptibly, he suggested the idea of securing houses, ships, etc., from being damaged by lightning, by erecting pointed rods that should rise some feet above the most elevated part, and descend some feet into the ground or the water. The effect of these he concluded would be either to prevent a stroke by repelling the cloud beyond the striking distance, or by drawing off the electrical fire which it contained; or, if they could not effect this, they would at least conduct the electric matter to the earth, without any injury to the building

“It was not until the summer of 1752 that he was enabled to complete his grand and unparalleled discovery by experiment. The plan which he had originally proposed was, to erect, on some high tower or other elevated place, a sentry-box, from which should rise a pointed iron rod, insulated by being fixed in a cake of resin. Electrified clouds passing over

this would, he conceived, impart to it a portion of their electricity, which would be rendered evident to the senses by sparks being emitted when a key, the knuckle, or other conductor, was presented to it. Philadelphia at this time afforded no opportunity of trying an experiment of this kind. While Franklin was waiting for the erection of a spire, it occurred to him that he might have more ready access to the region of clouds by means of a common kite. He prepared one by fastening two cross sticks to a silk handkerchief, which would not suffer so much from the rain as paper. To the upright stick was affixed an iron point. The string was, as usual, of hemp, except the lower end, which was silk. Where the hempen string terminated, a key was fastened. With this apparatus, on the appearance of a thunder-gust approaching, he went out into the commons, accompanied by his son, to whom alone he communicated his intentions, well knowing the ridicule which, too generally for the interest of science, awaits unsuccessful experiments in philosophy. He placed himself under a shed, to avoid the rain; his kite was raised, a thunder-cloud passed over it, no sign of electricity appeared. He almost despaired of success, when suddenly he observed the loose fibres of his string to move towards an erect position. He now presented his knuckle to the key, and received a strong spark. How exquisite must his sensations have been at this moment! On this experiment depended the fate of his theory. If he succeeded, his name would rank high among those who had improved science; if he failed, he must inevitably be subjected to the derision of mankind, or, what is worse, their pity, as a well-meaning man, but a weak, silly projector. The anxiety with which he looked for the result of his experiment may be easily conceived. Doubts and despair had begun to prevail, when the fact was ascertained, in so clear a manner, that even the most incredulous could no longer withhold their assent. Repeated sparks were drawn from the key, a phial was charged, a shock given,

and all the experiments made which are usually performed with electricity.

“About a month before this period, some ingenious Frenchman had completed the discovery in the manner originally proposed by Dr. Franklin. The letters which he sent to Mr. Collinson, it is said, were refused a place in the Transactions of the Royal Society of London. However this may be, Collinson published them in a separate volume, under the title of ‘New Experiments and Observations on Electricity, made at Philadelphia, in America.’ They were read with avidity, and soon translated into different languages. A very incorrect French translation fell into the hands of the celebrated Buffon, who, notwithstanding the disadvantages under which the work labored, was much pleased with it, and repeated the experiments with success. He prevailed on his friend, M. Dalibard, to give his countrymen a more correct translation of the works of the American electrician. This contributed much towards spreading a knowledge of Franklin’s principles in France. The King, Louis the Fifteenth, hearing of these experiments, expressed a wish to be a spectator of them. A course of experiments was given at the seat of the Duc D’Ayen, at St. Germain, by M. de Lor. The applauses which the King bestowed upon Franklin excited in Buffon, Dalibard, and De Lor an earnest desire of ascertaining the truth of his theory of thunder-gusts. Buffon erected his apparatus on the tower of Montbar, M. Dalibard at Marly-la-ville, and De Lor at his house in the *Estrapade* at Paris, some of the highest ground in that capital. Dalibard’s machine first showed signs of electricity. On the 10th of May, 1752, a thunder-cloud passed over it, in the absence of M. Dalibard, and a number of sparks were drawn from it by Coiffier, joiner, with whom Dalibard had left directions how to proceed, and by M. Raulet, the prior of Marly-la-ville.

“An account of this experiment was given to the Royal Academy of Sciences, by M. Dalibard, in a Memoir dated

May 13th 1752. On the 18th of May, M. de Lor proved equally successful with the apparatus erected at his own house. These philosophers soon excited those of other parts of Europe to repeat the experiment; amongst whom none signalized themselves more than Father Beccaria, of Turin, to whose observations science is much indebted. Even the cold regions of Russia were penetrated by the ardor for discovery. Professor Richmann bade fair to add much to the stock of knowledge on this subject, when an unfortunate flash from his conductor put a period to his existence.

“By these experiments Franklin’s theory was established in the most convincing manner.

“Besides these great principles, Franklin’s letters on electricity contain a number of facts and hints which have contributed greatly towards reducing this branch of knowledge to a science. His friend, Mr. Kinnersley, communicated to him a discovery of the different kinds of electricity excited by rubbing glass and sulphur. This, we have said, was first observed by M. Du Faye, but it was for many years neglected. The philosophers were disposed to account for the phenomena rather from a difference in the quantity of electricity collected, and even Du Faye himself seems at last to have adopted this doctrine. Franklin at first entertained the same idea, but upon repeating the experiments he perceived that Mr. Kinnersley was right, and that the *vitreous* and *resinous* electricity of Du Faye were nothing more than the *positive* and *negative* states, which he had before observed, and that the glass globe charged *positively*, or increased, the quantity of electricity on the prime conductor, while the globe of sulphur diminished its natural quantity, or charged *negatively*. These experiments and observations opened a new field for investigation, upon which electricians entered with avidity; and their labors have added much to the stock of our knowledge.

“Franklin’s letters have been translated into most of the

European languages, and into Latin. In proportion as they have become known his principles have been adopted."

In speaking of the first publication of his papers on electricity, Franklin himself says: "Obliged as we were to Mr. Collinson for the present of the tube, &c., I thought it right he should be informed of our success in using it, and wrote him several letters containing accounts of our experiments. He got them read in the Royal Society, where they were not at first thought worth so much notice as to be printed in their Transactions. One paper, which I wrote to Mr. Kinnersley, on the sameness of lightning with electricity, I sent to Mr. Mitchel, an acquaintance of mine, and one of the members also of that Society, who wrote me word that it had been read but was laughed at by the connoisseurs. The papers, however, being shown to Dr. Fothergill, he thought them of too much value to be stifled, and advised the printing of them. Mr. Collinson then gave them to Cave for publication in his *Gentleman's Magazine*, but he chose to print them separately in a pamphlet, and Dr. Fothergill wrote the preface. Cave, it seems, judged rightly for his profession, for by the additions that arrived afterwards they swelled to a quarto volume, which has had five editions, and cost him nothing for copy-money."

The following is an extract from the Preface to the first edition of the pamphlet published by Cave, as above mentioned.

"It may be necessary to acquaint the reader that the following observations and experiments were not drawn up with a view to their being made public, but were communicated at different times, and most of them in letters, written on various topics, as matter only of private amusement.

"But some persons to whom they were read, and who had themselves been conversant in electrical disquisitions, were of opinion they contained so many curious and interesting particulars relative to this affair, that it would be doing a kind of injustice to the public to confine them solely to the limits of a private acquaintance.

“The editor was therefore prevailed upon to commit such extracts of letters and other detached pieces as were in his hands to the press, without waiting for the ingenious author’s permission so to do ; and this was done with the less hesitation, as it was apprehended the author’s engagements in other affairs would scarce afford him leisure to give the public his reflections and experiments on the subject, finished with that care and precision of which the treatise before us shows he is alike studious and capable.”

Dr. Priestley, in his *History of Electricity*, published in the year 1767, gives a full account of Franklin’s experiments and discoveries.

“Nothing was ever written upon the subject of electricity,” he says, “which was more generally read and admired in all parts of Europe, than these letters. There is hardly any European language into which they have not been translated ; and, as if this were not sufficient to make them properly known, a translation of them has lately been made into Latin. It is not easy to say, whether we are most pleased with the simplicity and perspicuity with which these letters are written, the modesty with which the author proposes every hypothesis of his own, or the noble frankness with which he relates his mistakes, when they were corrected by subsequent experiments.

“Though the English have not been backward in acknowledging the great merit of this philosopher, he has had the singular good fortune to be, perhaps, even more celebrated abroad than at home ; so that, to form a just idea of the great and deserved reputation of Dr. Franklin, we must read the foreign publications on the subject of electricity ; in many of which the terms *Franklinism*, *Franklinist*, and the *Franklinian system*, occur in almost every page. In consequence of this, Dr. Franklin’s principles bid fair to be handed down to posterity as equally expressive of the true principles of electricity, as the *Newtonian philosophy* is of the system of nature in general.”

The observations and theories of Franklin met with high favor in France, where his experiments were repeated and the results verified to the admiration of the scientific world. In the year 1753, his friend, Peter Collinson, wrote to him from London: "The King of France strictly commands the Abbé Mazéas to write a letter in the politest terms to the Royal Society, to return the King's thanks and compliments, in an express manner, to Mr. Franklin of Pennsylvania, for his useful discoveries in electricity, and the application of pointed rods to prevent the terrible effect of thunderstorms." And the same Mr. Collinson wrote as follows to the Reverend Jared Eliot, of Connecticut, in a letter dated London, November 22d, 1753: "Our friend Franklin will be honored on St. Andrew's day, the 30th instant, the anniversary of the Royal Society, when the Right Honorable the Earl of Macclesfield will make an oration on Mr. Franklin's new discoveries in electricity, and, as a reward and encouragement, will bestow on him a gold medal." This ceremony accordingly took place, and the medal was conferred.

XLIV.

TO PETER COLLINSON.

PHILADELPHIA, 11 July, 1747.

SIR :—In my last I informed you that in pursuing our electrical inquiries we had observed some particular phenomena which we looked upon to be new, and of which I promised to give you some account, though I apprehended they might not possibly be new to you, as so many hands are daily employed in electrical experiments on your side the water, some or other of which would probably hit on the same observations.

The first is the wonderful effect of pointed bodies, both in *drawing off* and *throwing off* the electrical fire. For example :

Place an iron shot of three or four inches diameter on the mouth of a clean, dry glass bottle. By a fine silken thread from the ceiling, right over the mouth of the bottle, suspend a small cork ball about the bigness of a marble, the thread of such a length as that the cork ball may rest against the side of the shot. Electrify the shot, and the ball will be repelled to the distance of four or five inches, more or less, according to the quantity of electricity. When in this state, if you present to the shot the point of a long, slender, sharp bodkin, at six or eight inches' distance, the repellency is instantly destroyed, and the cork flies to the shot. A blunt body must be brought within an inch and draw a spark to produce the same effect. To prove that the electrical fire is *drawn off* by the point, if you take the blade of the bodkin out of the wooden handle and fix it in a stick of sealing-wax, and then present it at the distance aforesaid, or if you bring it very near, no such effect follows ; but sliding one finger along the wax till you touch the blade, and the ball flies to the shot immediately. If you present the point in the dark you will see, sometimes at a foot distance and more, a light gather upon it, like that of a fire-fly or glow-worm ; the less sharp the point the nearer you must bring it to observe the light, and at whatever distance you see the light you may draw off the electrical fire and destroy the repellency. If a cork ball so suspended be repelled by the tube,

and a point be presented quick to it, though at a considerable distance, it is surprising to see how suddenly it flies back to the tube. Points of wood will do near as well as those of iron, provided the wood is not dry, for perfectly dry wood will no more conduct electricity than sealing-wax.

To show that points will *throw off*¹ as well as *draw off* the electrical fire; lay a long sharp needle upon the shot, and you cannot electrize the shot so as to make it repel the cork ball. Or fix a needle to the end of a suspended gun-barrel, or iron rod, so as to point beyond it like a little bayonet,² and while it remains there, the gun-barrel or rod cannot, by applying the tube to the other end, be electrized so as to give a spark, the fire continually running out silently at the point. In the dark you may see it make the same appearance as it does in the case before mentioned.

The repellency between the cork ball and the shot is likewise destroyed: 1st, by sifting fine sand on it,—this does it gradually; 2dly, by breathing on it; 3dly, by making a smoke about it from burning wood³;

¹ This power of points to *throw off* the electrical fire was first communicated to me by my ingenious friend, Mr. Thomas Hopkinson, since deceased, whose virtue and integrity, in every station of life, public and private, will ever make his memory dear to those who knew him, and knew how to value him.—F.

² This was Mr. Hopkinson's experiment, made with an expectation of drawing a more sharp and powerful spark from the point, as from a kind of focus, and he was surprised to find little or none.—F.

³ We suppose every particle of sand, moisture, or smoke, being first attracted and then repelled, carries off with it a portion of the electrical fire; but that the same still subsists in those particles till they communicate it to something else, and that it is never really destroyed. So, when water is thrown on common fire, we do not imagine the element is thereby destroyed or annihilated, but only dispersed, each particle of water carrying off in vapor its portion of the fire which it had attracted and attached to itself.—F.

4thly, by candle-light, even though the candle is at a foot distance,—these do it suddenly. The light of a bright coal from a wood fire, and the light of a red-hot iron do it likewise, but not at so great a distance. Smoke from dry rosin dropped on hot iron does not destroy the repellency, but is attracted by both shot and cork ball, forming proportionable atmospheres round them, making them look beautifully, somewhat like some of the figures in Burnet's or Whiston's *Theory of the Earth*.

N. B.—This experiment should be made in a closet where the air is very still, or it will be apt to fail.

The light of the sun thrown strongly on both cork and shot by a looking-glass, for a long time together, does not impair the repellency in the least. This difference between fire-light and sun-light is another thing that seems new and extraordinary to us.¹

We had for some time been of opinion that the electrical fire was not created by friction, but collected, being really an element diffused among, and attracted by other matter, particularly by water and metals. We had even discovered and demonstrated its afflux to the electrical sphere, as well as its efflux, by means of little, light windmill-wheels made of stiff paper vanes fixed obliquely, and turning freely on fine wire axes; also by little wheels of the same matter, but formed like water-wheels. Of the dispo-

¹ This different effect probably did not arise from any difference in the light, but rather from the particles separated from the candle, being first attracted and then repelled, carrying off the electric matter with them; and

from the rarefying the air, between the glowing coal or red-hot iron and the electrized shot, through which rarefied air, the electric fluid could more readily pass.—F.

sition and application of which wheels, and the various phenomena resulting, I could, if I had time, fill you a sheet.¹ The impossibility of electrizing one's self (though standing on wax) by rubbing the tube, and drawing the fire from it; and the manner of doing it by passing the tube near a person or thing standing on the floor, &c., had also occurred to us some months before Mr. Watson's ingenious *Sequel* came to hand; and these were some of the new things I intended to have communicated to you. But now I need only mention some particulars not hinted in that piece, with our reasonings thereupon; though perhaps the latter might well enough be spared.

1. A person standing on wax and rubbing the tube, and another person on wax drawing the fire, they will both of them (provided they do not stand so as to touch one another) appear to be electrized to a person standing on the floor; that is, he will perceive a spark on approaching each of them with his knuckle.

2. But if the persons on wax touch one another during the exciting of the tube, neither of them will appear to be electrized.

3. If they touch one another after exciting the tube, and drawing the fire as aforesaid, there will be a stronger spark between them than was between either of them and the person on the floor.

¹ These experiments with the wheels were made and communicated to me by my worthy and ingenious friend, Mr. Philip Syng; but we afterwards discovered that the motion of those

wheels was not owing to any afflux or efflux of the electric fluid, but to various circumstances of attraction and repulsion. 1750.—F.

4. After such strong spark neither of them discover any electricity.

These appearances we attempt to account for thus : We suppose, as aforesaid, that electrical fire is a common element, of which every one of the three persons above mentioned has his equal share, before any operation is begun with the tube. *A*, who stands on wax and rubs the tube, collects the electrical fire from himself into the glass ; and, his communication with the common stock being cut off by the wax, his body is not again immediately supplied. *B* (who stands on wax likewise), passing his knuckle along near the tube, receives the fire which was collected by the glass from *A* ; and his communication with the common stock being likewise cut off, he retains the additional quantity received. To *C*, standing on the floor, both appear to be electrized ; for he, having only the middle quantity of electrical fire, receives a spark upon approaching *B*, who has an over quantity ; but gives one to *A*, who has an under quantity. If *A* and *B* approach to touch each other, the spark is stronger, because the difference between them is greater. After such touch there is no spark between either of them and *C*, because the electrical fire in all is reduced to the original equality. If they touch while electrizing, the equality is never destroyed, the fire only circulating. Hence have arisen some new terms among us : we say *B* (and bodies like circumstanced) is electrized *positively* ; *A*, *negatively*. Or rather, *B* is electrized *plus* ; *A*, *minus*. And we daily in our experiments electrize bodies *plus* or *minus*, as we

think proper. To electrize *plus* or *minus*, no more needs to be known than this, that the parts of the tube or sphere that are rubbed, do, in the instant of the friction, attract the electrical fire, and therefore take it from the thing rubbing; the same parts immediately, as the friction upon them ceases, are disposed to give the fire they have received to any body that has less. Thus you may circulate it as Mr. Watson has shown; you may also accumulate or subtract it, upon or from any body, as you connect that body with the rubber, or with the receiver, the communication with the common stock being cut off. We think that ingenious gentleman was deceived when he imagined (in his *Sequel*) that the electrical fire came down the wire from the ceiling to the gun-barrel, thence to the sphere, and so electrized the machine and the man turning the wheel, &c. We suppose it was *driven off*, and not brought on through that wire; and that the machine and man, &c., were electrized *minus*—that is, had less electrical fire in them than things in common.

As the vessel is just upon sailing, I cannot give you so large an account of American electricity as I intended; I shall only mention a few particulars more. We find granulated lead better to fill the phial with than water, being easily warmed, and keeping warm and dry in damp air. We fire spirits with the wire of the phial. We light candles, just blown out, by drawing a spark among the smoke between the wire and snuffers. We represent lightning by passing the wire in the dark over a China plate that has gilt

flowers, or applying it to gilt frames of looking glasses, &c. We electrize a person twenty or more times running, with a touch of the finger on the wire, thus: He stands on wax. Give him the electrized bottle in his hand. Touch the wire with your finger and then touch his hand or face; there are sparks every time.¹ We increase the force of the electrical kiss vastly, thus: Let *A* and *B* stand on wax, or *A* on wax and *B* on the floor; give one of them the electrized phial in hand; let the other take hold of the wire; there will be a small spark; but when their lips approach they will be struck and shocked. The same if another gentleman and lady, *C* and *D*, standing also on wax, and joining hands with *A* and *B*, salute or shake hands. We suspend by fine silk thread a counterfeit spider made of a small piece of burnt cork, with legs of linen thread, and a grain or two of lead stuck in him to give him more weight. Upon the table, over which he hangs, we stick a wire upright, as high as the phial and wire, four or five inches from the spider; then we animate him by setting the electrified phial at the same distance on the other side of him; he will immediately fly to the wire of the phial, bend his legs in touching it, then spring off and fly to the wire in the table, thence again to the wire of the phial, playing with his legs against both, in a very entertaining manner, appearing perfectly alive

¹ By taking a spark from the wire, the electricity within the bottle is diminished; the outside of the bottle then draws some from the person holding it,

and leaves him in the negative state. Then when his hand or face is touched, an equal quantity is restored to him from the person touching.—F.

to persons unacquainted. He will continue this motion an hour or more in dry weather. We electrify, upon wax in the dark, a book that has a double line of gold round upon the covers, and then apply a knuckle to the gilding; the fire appears everywhere upon the gold like a flash of lightning; not upon the leather, nor if you touch the leather instead of the gold. We rub our tubes with buckskin and observe always to keep the same side to the tube and never to sully the tube by handling; thus they work readily and easily without the least fatigue, especially if kept in tight pasteboard cases lined with flannel, and sitting close to the tube.¹ This I mention because the European papers on electricity frequently speak of rubbing the tubes as a fatiguing exercise. Our spheres are fixed on iron axes which pass through them. At one end of the axis there is a small handle with which you turn the sphere like a common grindstone. This we find very commodious, as the machine takes up but little room, is portable, and may be enclosed in a tight box when not in use. It is true the sphere does not turn so swift as when the great wheel is used; but swiftness we think of little importance, since a few turns will charge the phial, &c., sufficiently.²

I am, &c.,

B. FRANKLIN.

¹ Our tubes are made here of green glass, twenty-seven or thirty inches long, as big as can be grasped.—F.

² This simple, easily-made machine was a contrivance of Mr. Syng's.—F.

XLV.

TO JARED ELIOT.¹

PHILADELPHIA, July 16, 1747.

DEAR SIR :—I received your favor of the 4th instant. I ought before this time to have acknowledged the receipt of the book, which came very safe, and in good order, to hand. We have many oil-mills in this province, it being a great country for flax. Linseed oil may now be bought for three shillings per gallon ; sometimes for two shillings and six pence ; but at New York, I have been told, it generally holds up at about eight shillings. Of this you can easily be satisfied, it being your neighbor government.

In your last, you inquired about the kind of land from which our hemp is raised. I am told it must be very rich land. Sometimes they use drained swamps and banked meadows ; but the greater part of our hemp is brought from Conestago, which is a large and very rich tract of land on the banks of the Susquehanna, a large fresh-water river. It is brought down in wagons.

If you should send any of your steel saws here for sale, I should not be wanting where my recommendation might be of service.

We have had as wet a summer as has been known here these thirty years, so that it was with difficulty our people got in their harvest. In some parts of the country a great deal of hay has been lost, and some

¹ The Reverend Jared Eliot was a graduate of Yale College, and for many years was settled as a clergyman at Killingworth in Connecticut. He

had a taste for philosophical studies, and published essays on agriculture, some of which passed through several editions.

corn mildewed ; but in general the harvest has been very great. The two preceding summers (particularly the last) were excessively dry. I think with you, it might be of advantage to know what the seasons are in the several parts of the country. One's curiosity in some philosophical points might also be gratified by it.

We have frequently, along this North American coast, storms from the northeast, which blow violently sometimes three or four days. Of these I have had a very singular opinion some years, viz., that, though the course of the wind is from northeast to southwest, yet the course of the storm is from southwest to northeast ; that is, the air is in violent motion in Virginia before it moves in Connecticut, and in Connecticut before it moves at Cape Sable, &c. My reasons for this opinion (if the like have not occurred to you) I will give in my next.

I thank you for the curious facts you have communicated to me relating to springs. I think with you, that most springs arise from rains, dews, or ponds, on higher grounds ; yet possibly some, that break out near the tops of high hollow mountains, may proceed from the abyss, or from water in the caverns of the earth, rarefied by its internal heat, and raised in vapor, till the cold region near the tops of such mountains condenses the vapor into water again, which comes forth in springs, and runs down on the outside of the mountains, as it ascended on the inside. There is said to be a large spring near the top of Teneriffe ; and that mountain was for-

merly a volcano, consequently hollow within. Such springs, if such there be, may properly be called springs of *distilled* water.

Now I mention mountains, it occurs to tell you that the great Appalachian Mountains, which run from York River, back of these colonies, to the Bay of Mexico, show in many places, near the highest parts of them, strata of sea shells; in some places the marks of them are in the solid rocks. It is certainly the *wreck* of a world we live on! We have specimens of these sea-shell rocks, broken off near the tops of these mountains, brought and deposited in our library as curiosities. If you have not seen the like, I will send you a piece. Farther, about mountains (for ideas will string themselves like ropes of onions); when I was once riding in your country, Mr. Walker showed me at a distance the bluff side or end of a mountain, which appeared striped from top to bottom, and told me the stone or rock of that mountain was divided by nature into pillars; of this I should be glad to have a particular account from you. I think I was somewhere near New Haven when I saw it.

You made some mistake when you intended to favor me with some of the new valuable grass seed (I think you called it herd-seed), for what you gave me is grown up and proves mere timothy; so I suppose you took it out of a wrong paper or parcel.

I wish your new law may have the good effect expected from it, in extricating your government from the heavy debt this war has obliged them to contract.

I am too little acquainted with your particular circumstances to judge of the prudence of such a law for your colony with any degree of exactness. But to a friend one may hazard one's notions, right or wrong ; and as you are pleased to desire my thoughts, you shall have them and welcome. I wish they were better.

First, I imagine that the five per cent. duty on goods imported from your neighboring governments, though paid at first hand by the importer, will not upon the whole come out of his pocket, but be paid in fact by the consumer ; for the importer will be sure to sell his goods as much dearer to reimburse himself ; so that it is only another mode of taxing your own people, though perhaps meant to raise money on your neighbours. Yet, if you can make some of the goods, heretofore imported, among yourselves, the advanced price of five per cent. may encourage your own manufacture, and in time make the importation of such articles unnecessary, which will be an advantage.

Secondly, I imagine the law will be difficult to execute, and require many officers to prevent smuggling in so extended a coast as yours ; and the charge considerable ; and, if smuggling is not prevented, the fair trader will be undersold and ruined. If the officers are many and busy, there will arise numbers of vexatious lawsuits and dissensions among your people. *Quære*, whether the advantages will over-balance.

Thirdly, if there is any part of your produce that you can well spare, and would desire to have taken off by your neighbours in exchange for something you more want, perhaps they, taking offence at your

selfish law, may in return lay such heavy duties or discouragements on that article, as to leave it a drug on your hands. As to the duty on transporting lumber (unless in Connecticut bottoms to the West Indies), I suppose the design is to raise the price of such lumber on your neighbours, and throw that advanced price into your treasury. But may not your neighbours supply themselves elsewhere? Or, if numbers of your people have lumber to dispose of, and want goods from, or have debts to pay to, your neighbours, will they not (unless you employ numbers of officers to watch all your creeks and landings) run their lumber, and so defeat the law? Or, if the law is strictly executed, and the duty discourage the transportation to your neighbours, will not all your people that want to dispose of lumber be laid at the mercy of those few merchants that send it to the West Indies, who will buy it at their own price, and make such pay for it as they think proper?

If I had seen the law and heard the reasons that are given for making it, I might have judged and talked of it more to the purpose. At present I shoot my bolt pretty much in the dark; but you can excuse and make proper allowance.

My best respects to good Mrs. Eliot and your sons; and, if it falls in your way, my service to the kind, hospitable people near the river, whose name I am sorry I have forgot.

I am, dear Sir, with the utmost regard,

Your obliged and humble servant,

B. FRANKLIN.

XLVI.

TO JARED ELIOT.

SIR:—I have perused your two Essays on Field Husbandry, and think the public may be much benefited by them; but, if the farmers in your neighborhood are as unwilling to leave the beaten road of their ancestors as they are near me, it will be difficult to persude them to attempt any improvement. Where the cash is to be laid out on a probability of a return, they are very averse to the running any risk at all, or even expending freely, where a gentleman of a more public spirit has given them ocular demonstration of the success.

About eighteen months ago, I made a purchase of about three hundred acres of land near Burlington, and resolved to improve it in the best and speediest manner, that I might be enabled to indulge myself in that kind of life which was most agreeable. My fortune, thank God, is such that I can enjoy all the necessaries and many of the indulgences of life; but I think that in duty to my children I ought so to manage, that the profits of my farm may balance the loss my income will suffer by my retreat to it. In order to this, I began with the meadow on which there had never been much timber, but it was always overflowed. The soil is very fine, and black about three feet; then it comes to a bluish clay. Of this deep meadow I have about eighty acres, forty of which had been ditched and mowed. The grass which comes in first after ditching is spear-grass and white clover; but the

weeds are to be mowed four or five years before they will be subdued, as the vegetation is very luxuriant.

This meadow had been ditched and planted with Indian corn, of which it produced above sixty bushels per acre. I first scoured up my ditches and drains, and took off all the weeds; then I ploughed it, and sowed it with oats in the last of May. In July I mowed them down together with the weeds, which grew plentifully among them, and they made good fodder. I immediately ploughed it again, and kept harrowing till there was an appearance of rain; and, on the 23d of August, I sowed near thirty acres with red clover and herd-grass, allowing six quarts of herd-grass and four pounds of red clover to an acre in most parts of it; in other parts, four quarts of herd-grass and three pounds of red clover. The red clover came up in four days and the herd-grass in six days; and I now find that, where I allowed the most seed, it protects itself the best against the frost. I also sowed an acre with twelve pounds of red clover, and it does well. I sowed an acre more with two bushels of rye-grass seed and five pounds of red clover; the rye-grass seed failed, and the red clover heaves out much for want of being thicker. However, in March next I intend to throw in six pounds more of red clover, as the ground is open and loose. As these grasses are represented not durable, I have sown two bushels of the sweeping of hay-lofts (where the best hay was used), well riddled, per acre, supposing that the spear-grass and white clover seed would be more equally scattered when the other shall fail.

What surprised me was to find that the herd-grass, whose roots are small and spread near the surface, should be less affected by the frost than the red clover, whose roots I measured in the last of October, and found that many of their tap roots penetrated five inches, and from its sides threw out near thirty horizontal roots, some of which were six inches long, and branched. From the figure of this root, I flattered myself that it would endure the heaving of the frost ; but I now see that wherever it is thin sown it is generally hove so far out that but a few of the horizontal and a small part of the tap roots remain covered, and I fear will not recover. Take the whole together, it is well matted, and looks like a green corn-field.

I have about ten acres more of this ground ready for seed in the spring, but expect to combat with the weeds a year or two. That sown in August I believe will rise so soon in the spring as to suppress them in a great measure.

My next undertaking was a round pond of twelve acres. Ditching round it, with a large drain through the middle, and other smaller drains, laid it perfectly dry. This, having first taken up all the rubbish, I ploughed up and harrowed it many times over, till it was smooth. Its soil is blackish ; but, in about a foot or ten inches, you come to a sand of the same color with the upland. From the birch that grew upon it, I took it to be of a cold nature, and therefore I procured a grass which would best suit that kind of ground, intermixed with many others, that I might

thereby see which suited it best. On the 8th of September, I laid it down with rye, which being harrowed in, I threw in the following grass seed : a bushel of Salem grass or feather-grass, half a bushel of timothy or herd-grass, half a bushel of rye-grass, a peck of burden-grass or blue bent, and two pints of red clover per acre (all the seed in the chaff except the clover), and bushed them in. I could wish they had been clean, as they would have come up sooner, and been better grown before the frost ; and I have found by experiment, that a bushel of clean chaff of timothy or Salem grass will yield five quarts of seed. The rye looks well, and there is abundance of timothy or Salem grass come up amongst it ; but it is yet small, and in that state there is scarce any knowing those grasses apart. I expect from the sand lying so near the surface, that it will suffer much in dry weather.

B. FRANKLIN.

XLVII.

TO PETER COLLINSON.

PHILADELPHIA, 1 September, 1747.

SIR :—The necessary trouble of copying long letters, which perhaps, when they come to your hands, may contain nothing new, or worth your reading (so quick is the progress made with you in electricity), half discourages me of writing any more on that subject. Yet I cannot forbear adding a few observations on M. Muschenbroek's wonderful bottle.

1. The non-electric contained in the bottle differs,

when electrized, from a non-electric electrized out of the bottle, in this : that the electrical fire of the latter is accumulated *on its surface*, and forms an electrical atmosphere round it of considerable extent ; but the electrical fire is crowded *into the substance* of the former, the glass confining it.¹

2. At the same time that the wire and the top of the bottle, &c., is electrized *positively* or *plus*, the bottom of the bottle is electrized *negatively* or *minus*, in exact proportion ; that is, whatever quantity of electrical fire is thrown in at the top, an equal quantity goes out of the bottom.² To understand this, suppose the common quantity of electricity in each part of the bottle, before the operation begins, is equal to twenty ; and at every stroke of the tube, suppose a quantity equal to one is thrown in ; then, after the first stroke, the quantity contained in the wire and upper part of the bottle will be twenty-one, in the bottom nineteen ; after the second, the upper part will have twenty-two, the lower eighteen ; and so on, till after twenty strokes, the upper part will have a quantity of electrical fire equal to forty, the lower part none ; and then the operation ends, for no more can be thrown into the upper part when no more can be driven out of the lower part. If you attempt to throw more in, it is spewed back through the wire, or flies out in loud cracks through the sides of the bottle.

¹ See this opinion rectified in § 16 and 17, p. 126. The fire in the bottle was found by subsequent experiments not to be contained in the non-electric, but *in the glass*. 1748.

² What is said here, and after, of the *top* and *bottom* of the bottle, is true of the *inside* and *outside* surfaces, and should have been so expressed.

3. The equilibrium cannot be restored in the bottle by *inward* communication or contact of the parts ; but it must be done by a communication formed *without* the bottle, between the top and bottom, by some non-electric, touching or approaching both at the same time ; in which case it is restored with a violence and quickness inexpressible ; or touching each alternately, in which case the equilibrium is restored by degrees.

4. As no more electrical fire can be thrown into the top of the bottle, when all is driven out of the bottom, so, in a bottle not yet electrized, none can be thrown into the top when none *can* get out at the bottom ; which happens either when the bottom is too thick, or when the bottle is placed on an electric *per se*. Again, when the bottle is electrized, but little of the electrical fire can be *drawn out* from the top, by touching the wire, unless an equal quantity can at the same time *get in* at the bottom.¹ Thus, place an electrized bottle on clean glass or dry wax, and you will not, by touching the wire, get out the fire from the top. Place it on a non-electric, and touch the wire, you will get it out in a short time,—but soonest when you form a direct communication as above.

So wonderfully are these two states of electricity, the *plus* and *minus*, combined and balanced in this miraculous bottle ! situated and related to each other in a manner that I can by no means comprehend ! If it were possible that a bottle should in one part contain a quantity of air strongly compressed, and in another part a perfect vacuum, we know the equilib-

¹ See the preceding note, relating to *top* and *bottom*.

rium would be instantly restored *within*. But here we have a bottle containing at the same time a *plenum* of electrical fire and a *vacuum* of the same fire, and yet the equilibrium cannot be restored between them but by a communication *without*, though the *plenum* presses violently to expand, and the hungry vacuum seems to attract as violently in order to be filled.

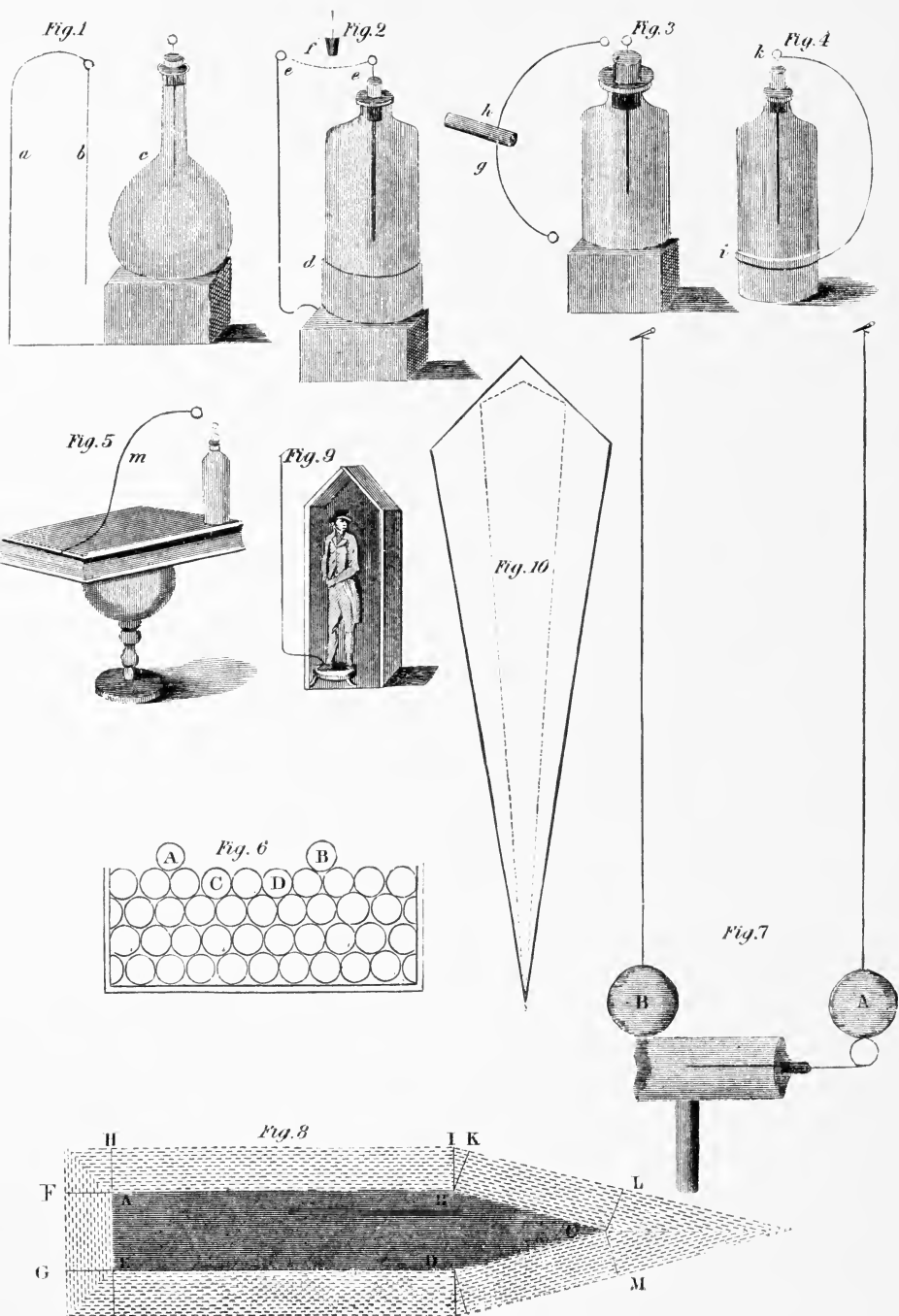
5. The shock to the nerves (or convulsion rather) is occasioned by the sudden passing of the fire through the body in its way from the top to the bottom of the bottle. The fire takes the shortest¹ course, as Mr. Watson justly observes. But it does not appear from experiment that, in order for a person to be shocked, a communication with the floor is necessary; for he that holds the bottle with one hand and touches the wire with the other, will be shocked as much, though his shoes be dry, or even standing on wax, as otherwise. And on the touch of the wire (or of the gun-barrel, which is the same thing), the fire does not proceed from the touching finger to the wire, as is supposed, but from the wire to the finger, and passes through the body to the other hand, and so into the bottom of the bottle.

Experiments confirming the above.

EXPERIMENT I.

Place an electrized phial on wax; a small cork ball, suspended by a dry silk thread, held in your hand and brought near to the wire, will first be attracted and then repelled; when in this state of repellency, sink

¹ Other circumstances being equal,



your hand that the ball may be brought towards the bottom of the bottle. It will be there instantly and strongly attracted till it has parted with its fire.

If the bottle had a *positive* electrical atmosphere, as well as the wire, an electrified cork would be repelled from one as well as from the other.

EXPERIMENT II.

PLATE I., FIG. 1.—From a bent wire (*a*) sticking in the table, let a small linen thread (*b*) hang down within half an inch of the electrized phial (*c*). Touch the wire or the phial repeatedly with your finger, and at every touch you will see the thread instantly attracted by the bottle. (This is best done by a vinegar-cruet, or some such bellied bottle.) As soon as you draw any fire out from the upper part by touching the wire, the lower part of the bottle draws an equal quantity in by the thread.

EXPERIMENT III.

FIG. 2.—Fix a wire in the lead, with which the bottom of the bottle is armed (*d*), so as that, bending upwards, its ring-end may be level with the top or ring-end of the wire in the cork (*e*), and at three or four inches distance. Then electrize the bottle and place it on wax. If a cork, suspended by a silk thread (*f*), hang between these two wires, it will play incessantly from one to the other till the bottle is no longer electrized; that is, it fetches and carries fire from the top to the bottom¹ of the bottle till the equilibrium is restored.

¹ See the preceding note relating to *top* and *bottom*.

EXPERIMENT IV.

FIG. 3.—Place an electrized phial on wax ; take a wire (*g*) in form of a C, the ends at such a distance, when bent, as that the upper may touch the wire of the bottle when the lower touches the bottom ; stick the outer part on a stick of sealing-wax (*h*), which will serve as a handle ; then apply the lower end to the bottom of the bottle, and gradually bring the upper end near the wire in the cork. The consequence is, spark follows spark till the equilibrium is restored. Touch the top first, and on approaching the bottom with the other end, you have a constant stream of fire from the wire entering the bottle. Touch the top and bottom together, and the equilibrium will instantly be restored, the crooked wire forming the communication.

EXPERIMENT V.

FIG. 4.—Let a ring of thin lead or paper surround a bottle (*i*), even at some distance from or above the bottom. From that ring let a wire proceed up till it touch the wire of the cork (*k*). A bottle so fixed cannot by any means be electrized ; the equilibrium is never destroyed ; for while the communication between the upper and lower parts of the bottle is continued by the outside wire, the fire only circulates ; what is driven out at bottom is constantly supplied from the top.¹ Hence a bottle cannot be electrized that is foul or moist on the outside, if such moisture continue up to the cork or wire.

¹ See the preceding note relating to *top* and *bottom*.

EXPERIMENT VI.

Place a man on a cake of wax, and present him the wire of the electrified phial to touch, you standing on the floor and holding it in your hand. As often as he touches it he will be electrified *plus* ; and any one standing on the floor may draw a spark from him. The fire in this experiment passes out of the wire into him ; and at the same time out of your hand into the bottom of the bottle.

EXPERIMENT VII.

Give him the electrical phial to hold, and do you touch the wire ; as often as you touch it he will be electrified *minus*, and may draw a spark from any one standing on the floor. The fire now passes from the wire to you, and from him into the bottom of the bottle.

EXPERIMENT VIII.

Lay two books on two glasses, back towards back, two or three inches distant. Set the electrified phial on one, and then touch the wire ; that book will be electrified *minus*, the electrical fire being drawn out of it by the bottom of the bottle. Take off the bottle, and, holding it in your hand, touch the other with the wire ; that book will be electrified *plus* ; the fire passing into it from the wire, and the bottle at the same time supplied from your hand. A suspended small cork ball will play between these books till the equilibrium is restored.

EXPERIMENT IX.

When a body is electrized *plus*, it will repel a positively electrified feather or small cork ball. When *minus* (or when in the common state), it will attract them, but stronger when *minus* than when in the common state, the difference being greater.

EXPERIMENT X.

Though, as in *Experiment VI*, a man standing on wax may be electrized a number of times by repeatedly touching the wire of an electrized bottle (held in the hand of one standing on the floor), he receiving the fire from the wire each time; yet holding it in his own hand and touching the wire, though he draws a strong spark, and is violently shocked, no electricity remains in him, the fire only passing through him from the upper to the lower part of the bottle. Observe, before the shock, to let some one on the floor touch him to restore the equilibrium of his body; for in taking hold of the bottom of the bottle he sometimes becomes a little electrized *minus*, which will continue after the shock, as would also any *plus* electricity which he might have given him before the shock. For restoring the equilibrium in the bottle does not at all affect the electricity in the man through whom the fire passes; that electricity is neither increased nor diminished.

EXPERIMENT XI.

The passing of the electrical fire from the upper to the lower part¹ of the bottle, to restore the equilibrium, is rendered strongly visible by the following

¹ That is, from the *inside* to the *outside*.

pretty experiment. Take a book whose covering is filleted with gold; bend a wire of eight or ten inches long in the form of (*m*), Fig. 5, slip it on the end of the cover of the book, over the gold line, so as that the shoulder of it may press upon one end of the gold line, the ring up, but leaning towards the other end of the book. Lay the book on a glass or wax,¹ and on the other end of the gold lines set the bottle electrized; then bend the springing wire by pressing it with a stick of wax till its ring approaches the ring of the bottle wire; instantly there is a strong spark and stroke, and the whole line of gold, which completes the communication between the top and bottom of the bottle, will appear a vivid flame, like the sharpest lightning. The closer the contact between the shoulder of the wire and the gold at one end of the line, and between the bottom of the bottle and the gold at the other end, the better the experiment succeeds. The room should be darkened. If you would have the whole filleting round the cover appear in fire at once, let the bottle and wire touch the gold in the diagonally opposite corners.

I am, &c.

B. FRANKLIN.

XLVIII.

TO CADWALLADER COLDEN.

PHILADELPHIA, 1 October, 1747.

SIR:—I send you herewith the *History of the Five Nations*. You will perceive that Osborne, to

¹ Placing the book on glass or wax is not necessary to produce the appearance; it is only to show that the

visible electricity is not brought up from the common stock in the earth.

puff up the book, has inserted the charters, &c., of his Province, all under the title of *History of the Five Nations*, which I think was not fair, but it is a common trick of booksellers.

Mr. James Read, to whom Mr. Osborne has sent a parcel of books by recommendation of Mr. Collinson, being engaged in business of another kind, talks of declining to act in disposing of them, and perhaps may put them into my hands. If he should, I will endeavour to do Mr. Osborne justice in disposing of them to the best advantage, as also of any other parcel he may send me from your recommendation.

Mr. Armit is returned well from New England. As he has your power of attorney, and somewhat more leisure at present than I have, I think to put your letter to Mr. Hughes into his hands, and desire him to manage the affair of your servant. I shall write a line besides to Hughes, that he would assist in obliging the servant to do you justice, which may be of some service, as he owns himself obliged to me, for recovering a servant for him that had been gone above a twelvemonth. I am, Sir, &c.

B. FRANKLIN.

XLIX.

TO CADWALLADER COLDEN.

PHILADELPHIA, 27 November, 1747.

SIR :—The violent party spirit that appears in all the votes, &c., of your Assembly seems to me extremely unseasonable as well as unjust, and to threaten mis-

chief not only to yourselves but to your neighbours. It begins to be plain that the French may reap great advantages from your divisions. God grant they may be as blind to their own interest, and as negligent of it as the English are of theirs. It must be inconvenient to you to remove your family, but more so to you and them to live under continual apprehensions and alarms. I shall be glad to hear you are all in a place of safety.

Though *Plain Truth*¹ bore somewhat hard on both parties here, it has had the happiness not to give much offence to either. It has wonderfully spirited us up to defend ourselves and country, to which end great numbers are entering into an association, of which I send you a copy enclosed. We are likewise setting on foot a lottery to raise three thousand pounds for erecting a battery of cannon below the city. We have petitioned the Proprietor to send us some from England, and have ordered our correspondents to send us over a parcel, if the application to the Proprietor fails. But, lest by any accident they should miscarry, I am desired to write to you and ask your opinion whether, if our government should apply to Governor Clinton to borrow a few of your spare cannon till we could be supplied, such application might probably meet with success. Pray excuse the effects of haste on this letter.

I am, Sir, with the greatest respect, your most obliged humble servant,

B. FRANKLIN.

¹ See this tract, *supra*.

L.

TO JAMES LOGAN.¹

Monday Noon [4 December, 1747].

SIR :—I am heartily glad you approve of our proceedings. We shall have arms for the poor in the

¹ James Logan, descended from an ancient family of Restalrig in Scotland, was born at Lurgan, in Ireland, 1674. His father was a man of great learning, and educated for the Scottish church; but, having been converted to the principles of the Quakers, he was, at the time of his son's birth, a teacher in a public school in that Society. At an early age James Logan became imbued with a love of letters and science. Before he was thirteen years old, he had made uncommon proficiency in the Latin, Greek, and Hebrew languages. He soon afterwards acquired a taste for the mathematics, in which he became profoundly skilled, and which science seems to have been his favorite study through life. For a few years he had charge of a large Grammar School at Bristol, in England; but he afterwards engaged in commerce. Becoming acquainted with William Penn, he was induced by him to give up his plans of life, and accompany him as secretary on his second visit to Pennsylvania, in 1699.

Having acquired the entire confidence of the Proprietor, he was left by him in charge of his private estate, and in the important offices of Provincial Secretary, Commissioner of Property, and Receiver-General. In the course of his life he filled the places of Recorder of the City of Philadelphia, Presiding Judge of Common Pleas, Chief Justice of the Province, and President of the Council, in which last office he governed the Province for two years, from 1736 to 1738. He also had the entire management of the intercourse with the Indians. When William Penn left the Province, in 1701, he presented Mr. Logan to the assembled Chiefs as his representative;

and this choice of an agent was justified by his conduct. During the whole of his public life the affectionate intercourse commenced by William Penn, and the confidential reliance inspired by his justice and benevolence, were preserved by James Logan. It is perhaps worthy of being mentioned that the celebrated Mingo Chief, whose eloquent speech is contained in Mr. Jefferson's *Notes on Virginia*, was named Logan by his father Shickellamy, as a mark of respect and gratitude for the friend and protector of himself and his race.

A history of James Logan's public life would be that of Pennsylvania during the first forty years of the last century. Venerating William Penn, with whose noble and generous nature he was well acquainted, he stood up at all times in his defence against the encroachments of the Assembly; and if he forfeited his popularity, and endured calumny and persecution, he preserved his fidelity, the confidence of his employers, and the respect of all good men. Weary of the burden of public office he retired in 1738 from all his salaried employments, remaining only a short time longer a member of the Provincial Council. At his estate, called Stenton, near Germantown, he passed in retirement the remainder of his days devoted to agriculture and his favorite studies. A large collection of mathematical papers in manuscript, exhibiting extensive and varied researches in that science, are marked on the envelope, *Horæ ante Nonam*, and are doubtless the results of his morning recreations before office hours. His correspondence with the literary men of America and Europe, from the year 1713, proves that there

spring, and a number of battering cannon. The place for the batteries is not yet fixed ; but it is generally thought that near Red Bank will be most suitable, as the enemy must there have natural difficulties to struggle with, besides the channel being narrow. The Dutch are as hearty as the English. *Plain Truth*

was scarcely a department of learning in which he was not interested. History, archæology, criticism, theology, ethics, natural philosophy, anatomy, and law, are treated of. Sometimes Hebrew or Arabic characters and algebraic formulas, roughen the pages of his letter books. Sometimes his letters convey a lively Greek ode to a learned friend, and often they are written in the Latin language. Among his correspondents in this country were Cadwallader Colden, Governor Burnet, and Colonel Hunter, the accomplished friend of Swift ; and in Europe, Collinson, Fothergill, Mead, Sir Hans Sloane, Flamsteed, Jones the mathematician, father of the celebrated Sir William Jones, Fabricius, Gronovius, and Linnæus ; the last of whom gave the name of Logan to a Class in botany.

Of his printed writings perhaps the best known is his translation of Cicero's *Cato Major, or a Discourse on Old Age*, with explanatory notes, which was printed by Franklin in 1744, and several times reprinted in England. He also wrote *Experimenta et Meletemata de Plantarum Generatione*, printed at Leyden in 1739, and afterwards translated by Dr. Fothergill and printed in London ; *Demonstrationes de Radium in Superficies sphericas ab Axe incidentium a primario Foco Aberrationibus*, printed at Leyden, 1741 ; *Epistola ad Virum Clarissimum Joannem Albertum Fabricium*, printed at Amsterdam, 1740 ; *A Translation of Cato's Disticks into English Verse*, printed at Philadelphia. He furnished contributions to the Philosophical Transactions, and wrote other pieces on various subjects in Latin and English, some of which were published. He also left some

curious papers in manuscript, particularly part of an ethical treatise, entitled *The Duties of Man, as they may be deduced from Nature*. This was prepared with great care. Parts of it were sent to his friends in England and received their high commendation ; but it seems never to have been completed. Also fragments of a *Dissertation on the Writings of Moses ; A Defence of Aristotle and the Ancient Philosophers ; Essays on Languages and on the Antiquities of the British Isles ; a Translation of Maurocordatus περι καθηκόντων*, and of Philo Judæus' *Allegory of the Essæans*.

His acquaintance with Franklin began at an early date, and he had the highest opinion of him from the first, as an industrious, useful, and ingenious man ; giving him every encouragement as a printer, and much assistance in his scientific pursuits and public enterprises. In the military defence of the city he was prominently active, notwithstanding his connection with the Friends' Meeting. Indeed he at all times vindicated the principle of self-defence, as not only consistent with the Christian doctrines, but absolutely essential to the existence of society. In every other respect, though neither austere nor bigoted, he was a strict Friend. His virtues, his benevolence, his public integrity and services, his intimate connexion with William Penn, and the honor which his talents and learning conferred on the Society of Friends, perhaps saved him from the censure which a less eminent man might have incurred.

In addition to his services as a public man, and his high reputation among his contemporaries, the valuable library left by him to the City of

and the *Association* are in their language, and their parsons encouraged them. It is proposed to breed gunners by forming an artillery club, to go down weekly to the battery and exercise the great guns. The best engineers against Cape Breton were of such a club, tradesmen and shopkeepers of Boston. I was with them at the Castle ¹ at their exercise in 1743.

I have not time to write longer, nor to wait on you till next week. In general all goes well, and there is a surprising unanimity in all ranks. Near eight hundred have signed the *Association*, and more are signing hourly. One company of Dutch is complete. I am with great respect, Sir, &c.

B. FRANKLIN.

LI.

TO THOMAS HOPKINSON.²

PHILADELPHIA, 1747.

According to my promise, I send you *in writing*

Philadelphia should preserve his name in grateful and honorable remembrance. . . .

James Logan died on the 31st of October, 1751, aged seventy-seven years, and was buried in the Friends' graveyard at the corner of Arch Street and Fourth Street in Philadelphia.—J. FRANCIS FISHER.

This letter to Logan is in reply to one received from him, dated Dec. 3d, in which he had said :

"Our friends spared no pains to get and accumulate estates, and are yet against defending them, though these very estates are in a great measure the sole cause of their being invaded, as I showed to our Yearly Meeting, last September was six years, in a paper thou then printed. But I request to be informed, as soon as thou hast any

leisure, what measures are proposed to furnish small arms, powder, and ball to those in the country ; and particularly what measures are taken to defend our river, especially at the Red Bank, on the Jersey side, and on our own, where there ought not to be less than 40 guns, from six- to twelve-pounders. What gunners are to be depended on ?

"The project of a lottery to clear £3,000 is excellent, and I hope it will be speedily filled, nor shall I be wanting. But thou wilt answer all these questions and much more, if thou wilt visit me here, as on First day to dine with me, and thou wilt exceedingly oblige thy very loving friend."—EDITOR.

¹ Castle William in Boston Harbor.

² Thomas Hopkinson was born in

my observations on your book¹; you will be the better able to consider them, which I desire you to do at your leisure, and to set me right where I am wrong.

I stumble at the threshold of the building, and therefore have not read further. The author's *vis inertiae essential to matter*, upon which the whole work is founded, I have not been able to comprehend. And I do not think he demonstrates at all clearly (at least to me he does not), that there is really *such a property in matter*.

He says in No. 2: "Let a given body or mass of matter be called *a*, and let any given celerity be called *c*. That *celerity* doubled, tripled, &c., or halved, thirded, &c., will be $2c$, $3c$, &c., or $\frac{1}{2}c$, $\frac{1}{3}c$, &c., respectively. Also the *body* doubled, tripled, or

London, in April, 1709, had been a student at Oxford, came to America while young, married and settled in Philadelphia, where he died in 1751. He was an intimate friend of Franklin, and associated with him in his electrical and philosophical experiments. Mr. Hopkinson was chosen the first president of the *American Philosophical Society*, instituted in the year 1744, and also took an active part in founding the City Library and the College of Philadelphia. He left several children, among whom was Francis Hopkinson, one of the signers of the Declaration of Independence, well known as a writer, and for his valuable public services during and after the revolution.—EDITOR.

¹ It was a book by Andrew Baxter, entitled *An Inquiry into the Nature of the Human Soul, wherein its Immateriality is evinced*, &c. One of the chief objects of this book was to prove, that a resistance to any change is essential to matter, consequently inconsistent with *active* powers in it; and that, if matter wants active

powers, an *immaterial being* is necessary for all those effects, &c., ascribed to its own natural powers. After stating the several proofs, questioned by Dr. Franklin, of a *Vis inertiae*, or *force of inertness*, in matter, the author adds: "If the immateriality of the soul, the existence of God, and the necessity of a most particular, incessant providence in the world, are demonstrable from such plain and easy *principles*, the atheist has a desperate cause in hand." (See the third edition, pp. 1-8.) In fact, Mr. Baxter's doctrine seems to establish, rather than disprove, an activity in matter, and consequently to defeat his own conclusion, were not that conclusion to be found from other premises. *Prima facie*, it seems better for Mr. Baxter's system to suppose matter *incapable* of *force* or effort, even in the case, as he calls it, of resisting change, which case appears to me no other than the simple one of matter *not* altering its state *without* a cause, and a cause exactly proportioned to the effect.—B. V.

halved, thirded, will be $2a$, $3a$, or $\frac{1}{2}a$, $\frac{1}{3}a$, respectively." Thus far is clear. But he adds: "Now to move the body a , with the celerity c , requires a certain force to be impressed upon it; and to move it with a celerity as $2c$, requires *twice that force* to be impressed upon it, &c." Here I suspect some mistake creeps in, by the author's not distinguishing between a great force applied at once, and a small one continually applied, to a mass of matter, in order to move it. I think it is generally allowed by the philosophers, and, for aught we know, is certainly true, that there is no mass of matter, how great soever, but may be moved by any force how small soever (taking friction out of the question), and this small force, continued, will in time bring the mass to move with any velocity whatsoever. Our author himself seems to allow this towards the end of the same No. 2, when he is subdividing his celerities and forces; for as in continuing the division to eternity by his method of $\frac{1}{2}c$, $\frac{1}{3}c$, $\frac{1}{4}c$, $\frac{1}{5}c$, &c., you can never come to a fraction of velocity that is equal to $0c$, or no celerity at all; so, dividing the force in the same manner, you can never come to a fraction of force that will not produce an equal fraction of celerity.

Where, then, is the mighty *vis inertiae*, and what is its strength, when the greatest assignable mass of matter will give way to, or be moved by, the *least* assignable force? Suppose two globes equal to the sun and to one another, exactly equipoised in Jove's balance; suppose no friction in the centre of motion, in the beam, or elsewhere; if a musqueto then were to light on one of them, would he not give motion to

them both, causing one to descend and the other to rise? If it is objected, that the force of gravity helps one globe to descend, I answer, the same force opposes the other's rising. Here is an equality that leaves the whole motion to be produced by the musqueto, without whom those globes would not be moved at all. What, then, does *vis inertiae* do in this case? and what other effect could we expect *if there were no such thing?* Surely, if it were any thing more than a phantom, there might be enough of it in such *vast* bodies to annihilate, by its opposition to motion, so trifling a force!

Our author would have reasoned more clearly, I think, if, as he has used the letter *a* for a certain quantity of matter, and *c* for a certain quantity of celerity, he had employed one letter more, and put *f*, perhaps, for a certain quantity of force. This let us suppose to be done; and then, as it is a maxim that the force of bodies in motion is equal to the quantity of matter multiplied by the celerity (or $f = c \times a$); and as the force received by and subsisting in matter, when it is put in motion, can never exceed the force given; so, if *f* moves *a* with *c*, there must needs be required $2f$ to move *a* with $2c$; for *a* moving with $2c$ would have a force equal to $2f$, which it could not receive from $1f$; and this, not because there is such a thing as *vis inertiae*, for the case would be the same *if that had no existence*; but because nothing can give more than it has. And now again, if a thing *can* give what it has, if $1f$ can to $1a$ give $1c$, which is the same thing as giving it $1f$ (that is, if force applied to matter at

rest can put it in motion and give it *equal* force), where, then, is *vis inertiae*? If it existed at all in matter, should we not find the quantity of its resistance subtracted from the force given?

In No. 4, our author goes on and says: "The body *a* requires a certain force to be impressed on it to be moved with a celerity as *c*, or such a force is necessary; and therefore it makes a certain resistance, &c.; a body as *2a* requires *twice* that force to be moved with the *same celerity*, or it makes twice that resistance; and so on." This I think is not true; but that the body *2a*, moved by the force *1f* (though the eye may judge otherwise of it), does really move with the same celerity as it did when impelled by the same force; for *2a* is compounded of *1a* + *1a*; and if each of the *1a*'s, or each part of the compound, were made to move with *1c* (as they might be by *2f*), then the whole would move with *2c*, and not with *1c*, as our author supposes. But *1f* applied to *2a* makes each *a* move with $\frac{1}{2}c$; and so the whole moves with *1c*; exactly the same as *1a* was made to do by *1f* before. What is equal celerity but a *measuring the same space by moving bodies in the same time*? Now if *1a*, impelled by *1f*, measures one hundred yards in a minute; and in *2a*, impelled by *1f*, each *a* measures fifty yards in a minute, which added make one hundred; are not the celerities, as the forces, equal? And since force and celerity in the same quantity of matter are always in *proportion* to each other, why should we, when the quantity of matter is doubled, allow the force to continue unimpaired, and

yet suppose one half of the celerity to be lost? I wonder the more at our author's mistake in this point, since in the same number I find him observing: "We may easily conceive that a body, as $3a$, $4a$, &c., would make three or four bodies equal to once a , each of which would require once the first force to be moved with the celerity c ." If, then, in $3a$, each a requires once the first force f to be moved with the celerity c , would not each move with the force f and celerity c ? and consequently the whole be $3a$ moving with $3f$ and $3c$? After so distinct an observation, how could he miss of the consequence, and imagine that $1c$ and $3c$ were the same? Thus, as our author's abatement of celerity in the case of $2a$ moved by $1f$ is imaginary, so must be his additional resistance. And here again I am at a loss to discover any effect of the *vis inertiae*.

In No. 6 he tells us "that all this is likewise certain when taken the contrary way, viz., *from motion*

¹ Dr. Franklin's reasoning seems only to prove that where bodies of different masses have equal force, they "measure *equal* space in equal times." For, allowing that $2a$ moves one hundred yards in a minute (because it moves two separate fifty yards in that time), yet surely that space is not the *same* with that of the one hundred yards moved by $1a$, in the same time, though it may be equal to it; for the body $2a$ (that is, a and a), in the first case, describes a broad double space; and the body $1a$, in the second case, describes a long and single space. There is a farther consideration which may show the difference of celerity and force. For when Dr. Franklin says, in his second paragraph, "there is no mass of matter, how great so-

ever, but may be moved, *with any velocity*, by any continued force, how small soever," I ask whether the *moving body* must not have its force rather in the shape of much celerity than of much matter for this purpose; since without much celerity it would not move fast enough to *apply* its force to give the required velocity, even though its quantity of matter, and consequently of force, were infinite. "Equal celerity, therefore, in moving bodies is their measuring equal space, *along a continued line*, in equal time." Equal space measured along a number of *smaller parallel lines*, suits cases of *equal motion* indeed, but, according to this corrected definition, not of *equal celerity*.—B. V.

to rest; for the body *a* moving with a certain velocity, as *c*, requires a certain degree of force or resistance to stop that motion," &c., &c.; that is, in other words, equal force is necessary to destroy force. It may be so. But how does that discover a *vis inertiae*? Would not the effect be the same *if there were no such thing*? A force *1f* strikes a body *1a*, and moves it with the celerity *1c*—that is, with the force *1f*; it requires, even according to our author, only an opposing *1f* to stop it. But ought it not (if there were a *vis inertiae*) to have not only the force *1f*, but an additional force equal to the force of *vis inertiae*, that *obstinate power by which a body endeavours with all its might to continue in its present state, whether of motion or rest*? I say, ought there not to be an opposing force equal to the sum of these? The truth, however, is, that there is no body, how large soever, moving with any velocity, how great soever, but may be stopped by any opposing force, how small soever, continually applied. At least all our modern philosophers agree to tell us so.

Let me turn the thing in what light I please, I cannot discover the *vis inertiae*, nor any effect of it. It is allowed by all that a body *1a*, moving with a velocity *1c* and a force *1f*, *striking another* body *1a* at rest, they will afterwards *move on together*, each with $\frac{1}{2}c$ and $\frac{1}{2}f$; which, as I said before, is equal in the whole to *1c* and *1f*. If *vis inertiae*, as in this case, neither abates the force nor the velocity of bodies, what does it, or how does it discover itself?

I imagine I may venture to conclude my observa-

tions on this piece, almost in the words of the author: that, if the doctrines of the immateriality of the soul and the existence of God and of divine providence are demonstrable from no plainer principles, the *deist* (that is, *theist*) has a desperate cause in hand. I oppose *my theist* to his atheist, because I think they are diametrically opposite, and not near of kin, as Mr. Whitefield seems to suppose, where (in his Journal) he tells us: "*M. B. was a deist; I had almost said an atheist*"—that is, *chalk*; I had almost said *charcoal*.

The din of the Market¹ increases upon me; and that, with frequent interruptions, has, I find, made me say some things twice over; and, I suppose, forget some others I intended to say. It has, however, one good effect, as it obliges me to come to the relief of your patience with

Your humble servant,

B. FRANKLIN.

LII.

TO CADWALLADER COLDEN.

PHILADELPHIA, 6 August, 1747.

SIR:—The observations I sent you on Baxter's book were wrote on a sheet or two of paper in folio. He builds his whole argument on the *vis inertiae* of matter. I boldly denied the being of such a property, and endeavoured to demonstrate the contrary. If I succeeded, all his edifice falls of course, unless some other way supported. I desired your sentiments of my argument. You left the book for me at New

¹ Philadelphia Market, near which Dr. Franklin lived.

York, with a few lines containing a short censure upon the author, and that your time had been much taken up in town with business, but you were now about to retire into the country, where you should have leisure to peruse my papers ; since which I have heard nothing from you relating to them. I hope you will easily find them, because I have lost my rough draft ; but do not give yourself much trouble about them ; for if they are lost it is really no great matter.

I am glad to hear that some gentlemen with you are inclined to go on with electrical experiments. I am satisfied we have workmen here who can make the apparatus as well to the full as that from London ; and they will do it reasonably. By the next post I will send you their computation of the expense. If you shall conclude to have it done here I will oversee the work, and take care that every part be done to perfection as far as the nature of the thing admits.

Instead of the remainder of my rough minutes on electricity (which are indeed too rough for your view), I send you enclosed copies of two letters I lately wrote to Mr. Collinson on that subject. When you have perused them, please to leave them with Mr. Nichols, whom I shall desire to forward them per next post to a friend in Connecticut.

I am glad your *Philosophical Treatise* meets with so good reception in England. Mr. Collinson writes the same things to Mr. Logan ; and Mr. Rose, of Virginia, writes me that he had received accounts from his correspondents to the same purpose. I perceive by the papers that they have also lately re-

printed in London, your *History of the Five Nations* in octavo. If it come to your hands I should be glad to have a sight of it.

Mr. Logan, on a second reading of your piece on Fluxions lately, is satisfied that some of the faults he formerly objected to it were his own, and owing to his too little attention at that time. He desires me to tell you so, and that he asks your pardon. Upon what Mr. Collinson wrote, he again undertook to read and consider your Philosophical Treatise.¹ I have not seen him since, but shall soon, and will send you his sentiments.

I am, Sir,

With great respect,

Your most humble servant,

B. FRANKLIN.

LIII.

A CONJECTURE AS TO THE CAUSE OF THE HEAT OF THE
BLOOD IN HEALTH, AND OF THE COLD AND HOT
FITS OF SOME FEVERS.²

The parts of fluids are so smooth, and roll among one another with so little friction, that they will not

¹ The title of this treatise, as originally printed, was as follows: "*Explanation of the first Causes of Action in Matter; and of the Cause of Gravitation. London, 1746.*" A second edition enlarged was published five years afterwards with a different title, namely: "*The Principles of Action in Matter, the Gravitation of Bodies and the Motion of the Planets explained from those Principles. By Cadwallader Colden, Esquire. London. Printed for Dodsley,*

1751." Appended is a chapter entitled: "An Introduction to the Doctrine of Fluxions, or the Arithmetic of Infinities; in order to assist the Imagination in forming Conceptions of the Principles on which that Doctrine is founded."—ED.

² This piece I have found in Franklin's handwriting among the papers of Cadwallader Colden. Its date is uncertain, but it was probably written before the year 1750.—SPARKS.

by any (mechanical) agitation grow warmer. A phial half full of water shook with violence and long continued, the water neither heats itself nor warms the phial. Therefore the blood does not acquire its heat either from the motion and friction of its own parts, or its friction against the sides of its vessels.

But the parts of solids, by reason of their closer adhesion, cannot move among themselves without friction, and that produces heat. Thus, bend a plummet to and fro, and, in the place of bending, it shall soon grow hot. Friction on any part of our flesh heats it. Clapping of the hands warms them. Exercise warms the whole body.

The heart is a thick muscle, continually contracting and dilating nearly eighty times in a minute. By this motion there must be a constant interfrication of its constituent solid parts. That friction must produce a heat, and that heat must consequently be continually communicated to the perfluent blood.

To this may be added, that every propulsion of the blood by the contraction of the heart distends the arteries, which contract again in the intermission; and this distension and contraction of the arteries may occasion heat in them, which they must likewise communicate to the blood that flows through them.

That these causes of the heat of the blood are sufficient to produce the effect, may appear probable, if we consider that a fluid once warm requires no more heat to be applied to it in any part of time to keep it warm, than what it shall lose in an equal part of time.

A smaller force will keep a pendulum going, than what first set it in motion.

The blood, thus warmed in the heart, carries warmth with it to the very extremities of the body, and communicates to them ; but, as by this means its heat is gradually diminished, it is returned again to the heart by the veins for a fresh calefaction.

The blood communicates its heat, not only to the solids of our body, but to our clothes, and to a portion of the circumambient air. Every breath, though drawn in cold, is expired warm ; and every particle of the *materia perspirabilis* carries off with it a portion of heat.

While the blood retains a due fluidity, it passes freely through the minutest vessels, and communicates a proper warmth to the extremities of the body. But when by any means it becomes so viscid as not to be capable of passing those minute vessels, the extremities, as the blood can bring no more heat to them, grow cold.

The same viscosity in the blood and juices checks or stops the perspiration, by clogging the perspiratory duct, or, perhaps, by not admitting the perspirable parts to separate. Paper wet with size and water will not dry so soon as if wet with water only.

A vessel of hot water, if the vapor can freely pass from it, soon cools. If there be just fire enough under it to add continually the heat it loses, it retains the same degree. If the vessel be closed, so that the vapor may be retained, there will from the same fire be a continual accession of heat to the water, till it

risers to a great degree. Or, if no fire be under it, it will retain the heat it first had for a long time. I have experienced, that a bottle of hot water stopped, and put in my bed at night, has retained so much heat seven or eight hours, that I could not in the morning bear my foot against it, without some of the bedclothes intervening.

During the cold fit, then, perspiration being stopped, great part of the heat of the blood, that used to be dissipated, is confined and retained in the body ; the heart continues its motion, and creates a constant accession to that heat ; the inward parts grow very hot, and, by contact with the extremities, communicate that heat to them. The glue of the blood is by this heat dissolved, and the blood afterwards flows freely, as before the disorder.

LIV.

TO CADWALLADER COLDEN.

PHILADELPHIA, 27 January, 1748.

DEAR SIR :—I received your favor relating to the cannon. We have petitioned our Proprietors for some, and have besides wrote absolutely to London for a quantity, in case the application to the Proprietors should not succeed ; so that, accidents excepted, we are sure of being supplied some time next summer. But, as we are extremely desirous of having some mounted early in the spring, and perhaps, if your engineer should propose to use all you have, the works he may intend will not very soon be ready to receive

them, we should think ourselves exceedingly obliged to your government, if you would lend us a few for one year only. When you return to New York, I hope a great deal from your interest and influence.

Mr. Read, to whom Osborne consigned your books,¹ did not open or offer them for sale till within these two weeks, being about to remove when he received them, and having till now no conveniency of shelves, &c. In our two last papers he has advertised generally, that he has a parcel of books to sell—Greek, Latin, French, and English,—but makes no particular mention of the Indian History; it is therefore no wonder that he has sold none of them, as he told me a few days since. I had one of them from London, which I sent you before any of my friends saw it. So, as no one here has read it but myself, I can only tell you my own opinion, that it is a well-written, entertaining, and instructive piece, and must be exceedingly useful to all those colonies which have any thing to do with Indian affairs.

You have reason to be pleased with the mathematician's envious expression about your tract on gravitation. I long to see from Europe some of the deliberate and mature thoughts of their philosophers upon it.

To obtain some leisure I have taken a partner²

¹ Mr. Colden's "History of the Five Indian Nations," which was published in London, and copies of which were sent over to be sold in Philadelphia.

² David Hall, a Scotchman by birth, and a friend of Mr. Strahan, who had worked in the same office with Franklin as a journeyman printer in London. His

partnership with Franklin continued eighteen years, during which time he had the principal charge of the business. He conducted the *Pennsylvania Gazette*, and was likewise a bookseller and stationer. He died on the 17th of December, 1772, at the age of fifty-eight years. See Thomas' "History of Printing," vol. ii., p. 54.

into the printing-house ; but, though I am thereby a good deal disengaged from private business, I find myself still fully occupied. The association, lottery, and batteries fill up at present a great part of my time.¹

¹ In his Autobiography Franklin says : " I proposed a Lottery to defray the expense of building a battery below the town, and furnishing it with cannon. It filled expeditiously, and the battery was soon erected." " Mr. Logan put into my hands sixty pounds, to be laid out in lottery tickets for the battery, with directions to apply what prizes might be drawn wholly to that service." The following memoranda, found in Franklin's handwriting, show his manner of proceeding on this occasion :

" Proposed, That the Managers of the Lottery be applied to, to appoint suitable persons to go down the river to the Capes, and there consult with the persons in authority, and concert with them the modes of conveying intelligence to Philadelphia, whether by express or otherwise, when any enemies appear of such force as to make an alarm necessary, or even such as may endanger our trade ; who may likewise, in returning, land at such places as they judge suitable to give signals from, and endeavour to agree with the neighbouring inhabitants to keep watch and give the signals that may be agreed on, and engage to furnish them with guns, tar-barrels, or whatever else may be necessary for that purpose.

" That, for the more certain alarming the country on any occasion, as soon as the commander-in-chief at Philadelphia is well-informed of the approach, on our coasts, of any considerable force of the enemy, letters and orders may be despatched by expresses to the colonels of some or all of the regiments, as the occasion may require, who may immediately communicate the same to the other officers of the regiments, and they to the men

of the respective companies, who are immediately to meet at their usual place of rendezvous, and from thence march to such place as the colonel shall appoint for assembling his regiment ; and when all the companies are assembled, the regiment to march to such place as the commander-in-chief shall have directed.

" That, in case of any attempt on the inhabitants of the frontiers by small parties, as the Indian custom is, the superior officers of the regiment, being well-informed of the facts, may despatch away on horseback suitable bodies of active men, well acquainted with the woods, to such places or passes among the mountains, or near the conflux of rivers, by which it is probable the enemy must endeavour to make their retreat, and there to take post and lie in wait till their return, keeping proper scouts or sentinels at a distance of the body to give notice of their approach ; by which means they may be cut off, and the prisoners they take may be recovered ; a few instances of which would probably much intimidate those cowardly people, and make them afraid of attempting to attack us hereafter. And that such places may be known to more people, it might be proper for the officers beforehand to make a few journeys to them, guided by Indian traders or hunters, accompanied by such of their men as would be suitable to act on occasion and are disposed that way, observing and pointing out all the proper places for ambushes, &c. The expense of which journeys might be defrayed by the managers of the lottery.

" That, if there be certain accounts of any large body of the enemy marching towards any part of the frontiers,

I thank you for communicating the sheet on the first principles of morality, the continuation of which I shall be glad to see. I am, &c.

B. FRANKLIN.

LV.

TO JAMES LOGAN.

PHILADELPHIA, 27 January, 1748.

SIR :—I have not yet found the book, but suppose I shall to-morrow. The post goes out to-day, which allows me no time to look for it. We have a particular account from Boston of the guns there. They are in all thirty-nine, Spanish make, and new ; fifteen of them are twenty-eight pounders and twenty-four are fourteen pounders. We offer by this post £1500 this currency for them all, and suppose we shall get them.

The insurers, in consideration of the premium of twenty per cent, engage thus : that if the prizes arising against the tickets insured do not, one with

the colonels of the nearest frontier regiments may despatch expresses to the commander-in-chief at Philadelphia, with the vouchers of the intelligence, from whom orders may issue to raise such force as may be necessary to march to the assistance of such threatened frontier.

“That the people on the frontiers be advised to pitch on some suitable places at proper distances, and there enclose pieces of ground with palisades or stockades, so as to make them defensible against Indians, whereto, on occasion, their wives, children, and ancient persons may retire in time of danger. In parts where there may not be had sufficient voluntary labor

to erect such defences, and the neighbours, being poor, cannot bear the expense, some assistance might be obtained from the lottery managers, if another lottery should go on.

“That those managers be applied to, to offer rewards by public declaration to such as should be maimed in action, and pensions to poor widows, whose husbands should happen to fall in defence of their country.

“That a number of spades, pick-axes, shovels, &c., be provided for the city regiment, to be used by the negroes and others as pioneers for casting up sudden intrenchments on occasion.”—EDITOR.

another, make in the whole a sum equal to the first cost of the tickets, they will make up the deficiency. They now think it a disadvantageous agreement and have left off insuring, for though they would gain, as you observe, £1000 if they insured the whole at that rate in one lot, yet it will not be so when they insure a number of separate lots, as ten, twenty, or one hundred tickets in a lot, because the prizes falling in one lot do not help to make up the deficiencies in another. The person that insured your one hundred and twenty-five, did the next day give the whole premium to another, with six and a quarter per cent more, to be reinsured two thirds of them. I have not insured for anybody, so I shall neither lose nor gain that way. I will send the policy, that you may see it, with the book. I am, Sir, &c.,

B. FRANKLIN.

LVI.

TO JAMES LOGAN.

PHILADELPHIA, 30 January, 1748.

SIR :—I send you herewith the book, and enclosed is the policy. Here is no news but what is bad, namely, the taking of Mesnard, an account of which we have by way of Lisbon. He was carried into St. Malo. And just now we have advice from New York, that an express was arrived there from New England to inform the government that two prisoners, who had escaped from different parts of Canada and arrived in New England, agreed in declaring that three

thousand men were getting ready to march against Albany, which they intended to besiege and take, and that they were to be joined by a great body of Indians. They write from New York that the advice is credited there. I wish it may not prove too true, the wretched divisions and misunderstandings among the principal men in that government giving the enemy too much encouragement and advantage.

I hope you and your good family continue well, being with sincere respect and affection, &c.,

B. FRANKLIN.

LVII.

TO JAMES LOGAN.

PHILADELPHIA, 6 April, 1748.

SIR :—I have a letter from Mr. Samuel Laurens, of New York, who undertook to ship the guns for us, informing me that two small vessels had been agreed with to bring them round, but a sloop arriving there on Sunday last that had been chased in latitude thirty-six by a ship and brigantine, which were supposed to be the *Don Pedro* with a consort coming on this coast, the Governor and Council thought it more advisable to send them to Brunswick, which we since hear is done. Captain Wallace, a discreet old sea commander of this place, goes to-day or to-morrow to receive them there and provide carriages to bring them to Philadelphia. The postmaster at New York and another correspondent there write me that the ship seen was certainly the *Don Pedro*, the captain of

the vessel chased knowing her well, having often seen her at the Havana, where he has been several voyages with a flag of truce. He was very near being taken, but escaped by favor of the night. We are glad to hear the Don is come out with one consort only, as by some accounts we apprehended he intended to bring a small fleet with him. It now looks as if his design was more against our trade than our city.

With this I send you a packet from London and a pamphlet from Sweden, both left with me for you by the new Swedish missionary, Mr. Sandin. You must have heard that Mr. James Hamilton is appointed our governor, an event that gives us the more pleasure, as we esteem him a benevolent and upright as well as a sensible man. I hope he will arrive here early in the summer and bring with him some cannon from the Proprietors. I am, Sir, &c.,

B. FRANKLIN.

LVIII.

TO CADWALLADER COLDEN.

PHILADELPHIA, 29 September, 1748.

SIR:—I received your favor of the 12th instant, which gave me the greater pleasure, as it was so long since I had heard from you. I congratulate you on your return to your beloved retirement. I, too, am taking the proper measures for obtaining leisure to enjoy life and my friends more than heretofore, having put my printing-house under the care of my partner, David Hall, absolutely left off bookselling, and

removed to a more quiet part of the town, where I am settling my old accounts, and hope soon to be quite master of my own time, and no longer, as the song has it, *at every one's call but my own*. If health continue, I hope to be able in another year to visit the most distant friend I have, without inconvenience.

With the same views I have refused engaging further in public affairs. The share I had in the late Association, &c., having given me a little present run of popularity, there was a pretty general intention of choosing me a representative of the city at the next election of Assembly men ; but I have desired all my friends who spoke to me about it, to discourage it, declaring that I should not serve if chosen. Thus you see I am in a fair way of having no other tasks than such as I shall like to give myself, and of enjoying what I look upon as a great happiness, leisure to read, study, make experiments, and converse at large with such ingenious and worthy men as are pleased to honor me with their friendship or acquaintance, on such points as may produce something for the common benefit of mankind, uninterrupted by the little cares and fatigues of business. Among other pleasures I promise myself, that of corresponding more frequently and fully with Dr. Colden is none of the least. I shall only wish that what must be so agreeable to me may not prove troublesome to you.

I thank you for your kind recommending of me to Mr. Osborne. Mr. Read would readily have put the books into my hands, but it being now out of my

way to dispose of them, I propose to Mr. Hall the taking of them into his shop ; but he, having looked over the invoice, says they are charged so extravagantly high that he cannot sell them for any profit to himself without hurting the character of his shop. He will, however, at my request, take the copies of the Indian History and put them on sale ; but the rest of the cargo must lie, I believe, for Mr. Osborne's further orders. I shall write to him by our next vessels.

I am glad you have had an opportunity of gaining the friendship of Governor Shirley, with whom though I have not the honor of being particularly acquainted, I take him to be a wise, good, and worthy man. He is now a fellow sufferer with you, in being made the subject of some public, virulent, and senseless libels. I hope they give him as little pain.

Mr. Bartram continues well. Here is a Swedish gentleman,¹ a professor of botany, lately arrived, and I suppose will soon be your way, as he intends for Canada. Mr. Collinson and Dr. Mitchell recommend him to me as an ingenious man. Perhaps the enclosed (left at the post-office for you) may be from him. I have not seen him since the first day he came. I delivered yours to Mr. Evans ; and when I next see Mr. Bartram I shall acquaint him with what you say.

I am, with great esteem and respect, dear Sir, &c.,

B. FRANKLIN.

¹ This was Peter Kalm, the Swedish traveller and naturalist, who spent

some time in America, and afterwards published an account of his travels.

LIX.

TO JAMES LOGAN.

PHILADELPHIA, 30 October, 1748.

SIR :—I received your favor of the 28th, with the piece on the Generation of Plants, for which I thank you. Mr. Sandin, the Swedish missionary, who gave me Wahlboom's Oration to send you (as he passed through this town from New York, where he just arrived, to Racoon Creek, where he was to be settled), I have never seen since. Mr. Kalm came to see me the day he arrived, and brought me letters from Mr. Collinson and Dr. Mitchell, both recommending him. I invited him to lodge at my house, and offered him any service in my power ; but I never saw him afterwards till yesterday, when he told me that he had been much in the country, and at New York, since his arrival, but was now come to settle in town for the winter. To-day he dined with me ; and, as I had received yours in the morning, I took occasion to ask him if he had not yet seen Mr. Logan. He said, no ; that he had once been out with his countryman, Mr. Kock, proposing to wait on you as they returned ; but it proved later in the evening than they had expected, and he thought a visit then would be unseasonable, but proposed soon to pay his respects to you. Possibly he might at that time have the packet for you at Naglee's. I did not ask him about that. Inquiring of him what was become of Mr. Sandin, he told me that soon after he got to Racoon Creek, he was taken with the fever and

ague, which was followed by several other disorders, that constantly harassed him, and at length carried him off, just as Kalm arrived here, who, hearing that he was dangerously ill, hurried down to see him, but found him dead.

Sandin had a family with him, and, when here, was in haste to get to his settlement, but might intend to wait on you when he should come again to Philadelphia. Kalm, I suppose, might be in haste to see as much of the country as he could, and make his journey to New York before cold weather came on. I mention these things so particularly, that you may see you have not been purposely avoided by both these gentlemen, as you seem to imagine. I did not let Kalm know that you had mentioned him to me in your letter. I shall write to Mr. Hugh Jones, as you desire. I am, Sir, &c.,

B. FRANKLIN.

LX.

ADVICE TO A YOUNG TRADESMAN.

TO MY FRIEND, A. B. :

As you have desired it of me, I write the following hints, which have been of service to me, and may, if observed, be so to you.

Remember that *time* is money. He that can earn ten shillings a day by his labor, and goes abroad, or sits idle, one half of that day, though he spends but sixpence during his diversion or idleness, ought not to reckon *that* the only expense ; he has really spent, or rather thrown away, five shillings besides.

Remember that *credit* is money. If a man lets his money lie in my hands after it is due, he gives me the interest, or so much as I can make of it during that time. This amounts to a considerable sum where a man has good and large credit, and makes good use of it.

Remember that money is of the prolific, generating nature. Money can beget money, and its offspring can beget more, and so on. Five shillings turned is six, turned again it is seven and three-pence, and so on till it becomes an hundred pounds. The more there is of it, the more it produces every turning, so that the profits rise quicker and quicker. He that kills a breeding sow destroys all her offspring to the thousandth generation. He that murders a crown destroys all that it might have produced, even scores of pounds.

Remember that six pounds a year is but a groat a day. For this little sum (which may be daily wasted either in time or expense unperceived) a man of credit may, on his own security, have the constant possession and use of an hundred pounds. So much in stock, briskly turned by an industrious man, produces great advantage.

Remember this saying : *The good paymaster is lord of another man's purse.* He that is known to pay punctually and exactly to the time he promises, may at any time, and on any occasion, raise all the money his friends can spare. This is sometimes of great use. After industry and frugality, nothing contributes more to the raising of a young man in the world

than punctuality and justice in all his dealings ; therefore, never keep borrowed money an hour beyond the time you promised, lest a disappointment shut up your friend's purse for ever.

The most trifling actions that affect a man's credit are to be regarded. The sound of your hammer at five in the morning, or nine at night, heard by a creditor, makes him easy six months longer ; but if he sees you at a billiard-table or hears your voice at a tavern when you should be at work, he sends for his money the next day ; demands it, before he can receive it, in a lump.

It shows, besides, that you are mindful of what you owe ; it makes you appear a careful as well as an honest man, and that still increases your credit.

Beware of thinking all your own that you possess, and of living accordingly. It is a mistake that many people who have credit fall into. To prevent this, keep an exact account for some time, both of your expenses and your income. If you take the pains at first to mention particulars, it will have this good effect : you will discover how wonderfully small, trifling expenses mount up to large sums, and will discern what might have been and may for the future be saved, without occasioning any great inconvenience.

In short, the way to wealth, if you desire it, is as plain as the way to market. It depends chiefly on two words, *industry* and *frugality*—that is, waste neither *time* nor *money*, but make the best use of both. Without industry and frugality nothing will

do, and with them every thing. He that gets all he can honestly, and saves all he gets (necessary expenses excepted), will certainly become *rich*, if that Being who governs the world, to whom all should look for a blessing on their honest endeavours, doth not, in his wise providence, otherwise determine.

AN OLD TRADESMAN.

LXI.

TO PETER COLLINSON.

PHILADELPHIA, —, 1748.

SIR :

§ 1. There will be the same explosion and shock if the electrified phial is held in one hand by the hook and the coating touched with the other, as when held by the coating and touched at the hook.

2. To take the charged phial safely by the hook, and not at the same time diminish its force, it must first be set down on an electric *per se*.

3. The phial will be electrified as strongly, if held by the hook and the coating applied to the globe or tube, as when held by the coating and the hook applied.¹

4. But the *direction* of the electrical fire, being different in the charging, will also be different in the explosion. The bottle charged through the hook will be discharged through the hook ; the bottle charged through the coating will be discharged

¹ This was a discovery of the very ingenious Mr. Kinnersley, and by him communicated to me.—F.

through the coating, and not otherways, for the fire must come out the same way it went in.

5. To prove this, take two bottles that were equally charged through the hooks, one in each hand ; bring their hooks near each other, and no spark or shock will follow, because each hook is disposed to give fire and neither to receive it. Set one of the bottles down on glass, take it up by the hook, and apply its coating to the hook of the other, then there will be an explosion and shock, and both bottles will be discharged.

6. Vary the experiment by charging two phials equally, one through the hook, the other through the coating ; hold that by the coating which was charged through the hook, and that by the hook which was charged through the coating ; apply the hook of the first to the coating of the other, and there will be no shock or spark. Set that down on glass which you held by the hook, take it up by the coating, and bring the two hooks together ; a spark and shock will follow, and both phials be discharged.

In this experiment the bottles are totally discharged, or the equilibrium within them restored. The *abounding* of fire in one of the hooks (or rather in the internal surface of one bottle) being exactly equal to the *wanting* of the other ; and therefore, as each bottle has in itself the *abounding* as well as the *wanting*, the wanting and abounding must be equal in each bottle. See § 8, 9, 10, 11. But if a man holds in his hands two bottles, one fully electrified. the other not at all, and brings their hooks together,

he has but half a shock, and the bottles will both remain half electrified, the one being half discharged, and the other half charged.

7. Place two phials equally charged on a table, at five or six inches distance. Let a cork ball, suspended by a silk thread, hang between them. If the phials were both charged through their hooks, the cork, when it has been attracted and repelled by the one, will not be attracted, but equally repelled, by the other. But if the phials were charged, the one through the hook and the other through the coating,¹ the ball, when it is repelled from one hook, will be as strongly attracted by the other, and play vigorously between them, fetching the electric fluid from the one, and delivering it to the other, till both phials are nearly discharged.

8. When we use the terms of *charging* and *discharging* the phial, it is in compliance with custom, and for want of others more suitable. Since we are of opinion that there is really no more electrical fire in the phial after what is called its *charging*, than before, nor less after its *discharging*; excepting only the small spark that might be given to, and taken from, the non-electric matter, if separated from the bottle, which spark may not be equal to a five-hundredth part of what is called the explosion.

For if, on the explosion, the electrical fire came out of the bottle by one part, and did not enter in again

¹ To charge a bottle commodiously through the coating, place it on a glass stand; form a communication from the prime conductor to the coating, and another from the hook to the

wall or floor. When it is charged, remove the latter communication before you take hold of the bottle, otherwise great part of the fire will escape by it.—F.

by another, then, if a man, standing on wax, holding the bottle in one hand, takes the spark by touching the wire hook with the other, the bottle being thereby *discharged*, the man would be *charged*; or whatever fire was lost by one, would be found in the other, since there was no way for its escape; but the contrary is true.

9. Besides, the phial will not suffer what is called a *charging*, unless as much fire can go out of it one way, as is thrown in by another. A phial cannot be charged standing on wax or glass, or hanging on the prime conductor, unless a communication be formed between its coating and the floor.

10. But suspend two or more phials on the prime conductor, one hanging on the tail of the other, and a wire from the last to the floor, an equal number of turns of the wheel shall charge them all equally, and every one as much as one alone would have been; what is driven out at the tail of the first, serving to charge the second; what is driven out of the second charging the third; and so on. By this means a great number of bottles might be charged with the same labor, and equally high, with one alone; were it not that every bottle receives new fire, and loses its old with some reluctance, or rather gives some small resistance to the charging, which in a number of bottles becomes more equal to the charging power, and so repels the fire back again on the globe, sooner in proportion than a single bottle would do.

11. When a bottle is charged in the common way, its *inside* and *outside surfaces* stand ready, the

one to give fire by the hook, the other to receive it by the coating ; the one is full and ready to throw out, the other empty and extremely hungry ; yet, as the first will not *give out*, unless the other can at the same instant *receive in*, so neither will the latter receive in, unless the first can at the same instant give out. When both can be done at once, it is done with inconceivable quickness and violence.

12. So a straight spring (though the comparison does not agree in every particular), when forcibly bent, must, to restore itself, contract that side which in the bending was extended, and extend that which was contracted ; if either of these two operations be hindered, the other cannot be done. But the spring is not said to be *charged* with elasticity when bent, and *discharged* when unbent ; its quantity of elasticity is always the same.

13. Glass, in like manner, has within its substance always the same quantity of electrical fire, and that a very great quantity in proportion to the mass of glass, as shall be shown hereafter.

14. This quantity, proportioned to the glass, it strongly and obstinately retains, and will have neither more nor less, though it will suffer a change to be made in its parts and situation ; that is, we may take away part of it from one of the sides, provided we throw an equal quantity into the other.

15. Yet, when the situation of the electrical fire is thus altered in the glass, when some has been taken from one side and some added to the other, it will not be at rest, or in its natural state, till it is

restored to its original equality. And this restitution cannot be made through the substance of the glass, but must be done by a non-electric communication formed without, from surface to surface.

16. Thus, the whole force of the bottle and power of giving a shock is in the *glass itself*; the non-electrics in contact with the two surfaces serving only to *give* and *receive* to and from the several parts of the glass; that is, to give on one side and take away from the other.

17. This was discovered here in the following manner: purposing to analyze the electrified bottle, in order to find wherein its strength lay, we placed it on glass, and drew out the cork and wire, which for that purpose had been loosely put in. Then taking the bottle in one hand, and bringing a finger of the other near its mouth, a strong spark came from the water, and the shock was as violent as if the wire had remained in it, which showed that the force did not lie in the wire. Then, to find if it resided in the water, being crowded into and condensed in it, as confined by the glass, which had been our former opinion, we electrified the bottle again, and placing it on glass, drew out the wire and cork as before; then taking up the bottle, we decanted all its water into an empty bottle, which likewise stood on glass; and taking up that other bottle, we expected, if the force resided in the water, to find a shock from it; but there was none. We judged then that it must either be lost in decanting or remain in the first bottle. The latter we found to be true; for that bottle on trial gave the

shock, though filled up as it stood with fresh unelectrified water from a tea-pot. To find, then, whether glass had this property merely as glass, or whether the form contributed any thing to it, we took a pane of sash-glass, and laying it on the hand, placed a plate of lead on its upper surface; then electrified that plate, and bringing a finger to it, there was a spark and shock. We then took two plates of lead of equal dimensions, but less than the glass by two inches every way, and electrified the glass between them by electrifying the uppermost lead; then separated the glass from the lead, in doing which what little fire might be in the lead was taken out, and the glass being touched in the electrified parts with a finger, afforded only very small pricking sparks, but a great number of them might be taken from different places. Then dexterously placing it again between the leaden plates, and completing a circle between the two surfaces, a violent shock ensued, which demonstrated the power to reside in glass as glass, and that the non-electrics in contact served only, like the armature of a loadstone, to unite the force of the several parts, and bring them at once to any point desired; it being the property of a non-electric that the whole body instantly receives or gives what electrical fire is given to, or taken from, any one of its parts.

18. Upon this we made what we called an *electrical battery*, consisting of eleven panes of large sash-glass, armed with thin leaden plates, pasted on each side, placed vertically, and supported at two inches distance on silk cords, with thick hooks of leaden wire,

one from each side, standing upright, distant from each other, and convenient communications of wire and chain, from the giving side of one pane to the receiving side of the other, that so the whole might be charged together, and with the same labor as one single pane; and another contrivance to bring the giving sides, after charging, in contact with one long wire, and the receivers with another, which two long wires would give the force of all the plates of glass at once through the body of any animal forming the circle with them. The plates may also be discharged separately, or any number together that is required. But this machine is not much used, as not perfectly answering our intention with regard to the ease of charging, for the reason given, § 10. We made also of large glass panes magical pictures and self-moving animated wheels, presently to be described.

19. I perceive by the ingenious Mr. Watson's last book, lately received, that Dr. Bevis had used, before we had, panes of glass to give a shock¹; though till that book came to hand I thought to have communicated it to you as a novelty. The excuse for mentioning it here is, that we tried the experiment differently, drew different consequences from it (for Mr. Watson still seems to think the fire *accumulated on the non-electric*, that is, in contact with the glass, p. 72), and, as far as we hitherto know, have carried it farther.

20. The magical picture² is made thus. Having a

¹ I have since heard that Mr. Smeaton was the first who made use of panes of glass for that purpose.—F.

² Contrived by Mr. Kinnersley.—F.

large mezzotinto with a frame and glass, suppose of the KING (God preserve him), take out the print and cut a pannel out of it near two inches distant from the frame all round. If the cut is through the picture, it is not the worse. With thin paste or gum-water, fix the border that is cut off on the inside the glass, pressing it smooth and close; then fill up the vacancy by gilding the glass well with leaf-gold or brass. Gild likewise the inner edge of the back of the frame all round, except the top part, and form a communication between that gilding and the gilding behind the glass; then put in the board, and that side is finished. Turn up the glass and gild the fore side exactly over the back gilding, and when it is dry cover it by pasting on the pannel of the picture that hath been cut out, observing to bring the correspondent parts of the border and picture together, by which the picture will appear of a piece, as at first, only part is behind the glass and part before. Hold the picture horizontally by the top, and place a little movable gilt crown on the King's head. If now the picture be moderately electrified, and another person take hold of the frame with one hand, so that his fingers touch its inside gilding, and with the other hand endeavour to take off the crown, he will receive a terrible blow and fail in the attempt. If the picture were highly charged, the consequence might perhaps be as fatal¹ as that of high treason; for when the spark is taken through a quire of paper laid on the

¹ We have since found it fatal to small animals, though not to large ones.

The biggest we have yet killed is a hen. 1750.—F.

picture by means of a wire communication, it makes a fair hole through every sheet, that is, through forty-eight leaves, though a quire of paper is thought good armour against the push of a sword, or even against a pistol bullet, and the crack is exceedingly loud. The operator, who holds the picture by the upper end, where the inside of the frame is not gilt, to prevent its falling, feels nothing of the shock, and may touch the face of the picture without danger, which he pretends is a test of his loyalty. If a ring of persons take the shock among them, the experiment is called *The Conspirators*.

21. On the principle in § 7 that hooks of bottles differently charged will attract and repel differently, is made an electrical wheel that turns with considerable strength. A small upright shaft of wood passes at right angles through a thin round board of about twelve inches diameter, and turns on a sharp point of iron fixed in the lower end, while a strong wire in the upper end, passing through a small hole in a thin brass plate, keeps the shaft truly vertical. About thirty *radii* of equal length, made of sash-glass cut in narrow strips, issue horizontally from the circumference of the board, the ends most distant from the centre being about four inches apart. On the end of every one a brass thimble is fixed. If now the wire of a bottle electrified in the common way be brought near the circumference of this wheel, it will attract the nearest thimble, and so put the wheel in motion; that thimble in passing by receives a spark, and thereby being electrified is repelled, and so driven

forwards, while a second being attracted approaches the wire, receives a spark, and is driven after the first, and so on till the wheel has gone once round, when the thimbles before electrified approaching the wire, instead of being attracted as they were at first, are repelled, and the motion presently ceases. But if another bottle which has been charged through the coating be placed near the same wheel, its wire will attract the thimble repelled by the first, and thereby double the force that carries the wheel round, and not only taking out the fire that had been communicated to the thimbles by the first bottle, but even robbing them of their natural quantity, instead of being repelled when they come again towards the first bottle, they are more strongly attracted, so that the wheel mends its pace till it goes with great rapidity, twelve or fifteen rounds in a minute, and with such strength as that the weight of one hundred Spanish dollars, with which we once loaded it, did not seem in the least to retard its motion. This is called an electrical jack, and if a large fowl were spitted on the upright shaft, it would be carried round before a fire with a motion fit for roasting.

22. But this wheel, like those driven by wind, water, or weights, moves by a foreign force, to wit, that of the bottles. The self-moving wheel, though constructed on the same principles, appears more surprising. It is made of a thin, round plate of window-glass, seventeen inches diameter, well gilt on both sides, all but two inches next the edge. Two small hemispheres of wood are then fixed with cement to

elec.
mot.

the middle of the upper and under sides, centrally opposite, and in each of them a thick strong wire eight or ten inches long, which together make the axis of the wheel. It turns horizontally on a point at the lower end of its axis, which rests on a bit of brass cemented with a glass salt-cellar. The upper end of its axis passes through a hole in a thin brass plate cemented to a long strong piece of glass, which keeps it six or eight inches distant from any non-electric, and has a small ball of wax or metal on its top to keep in the fire. In a circle on the table which supports the wheel, are fixed twelve small pillars of glass, at about four inches distance, with a thimble on the top of each. On the edge of the wheel is a small leaden bullet, communicating by a wire with the gilding of the *upper* surface of the wheel ; and about six inches from it is another bullet, communicating in like manner with the *under* surface. When the wheel is to be charged by the upper surface, a communication must be made from the under surface to the table. When it is well charged it begins to move ; the bullet nearest to a pillar moves towards the thimble on that pillar, and passing by electrifies it, and then pushes itself from it ; the succeeding bullet, which communicates with the other surface of the glass, more strongly attracts that thimble, on account of its being before electrified by the other bullet ; and thus the wheel increases its motion till it comes to such a height that the resistance of the air regulates it. It will go half an hour, and make, one minute with another, twenty turns in a minute, which is six hundred

turns in the whole ; the bullet of the upper surface giving in each turn twelve sparks to the thimbles, which makes seven thousand two hundred sparks ; and the bullet of the under surface receiving as many from the thimbles ; those bullets moving in the time near two thousand five hundred feet. The thimbles are well fixed, and in so exact a circle that the bullets may pass within a very small distance of each of them. If, instead of two bullets, you put eight, four communicating with the upper surface and four with the under surface, placed alternately, which eight at about six inches distance completes the circumference, the force and swiftness will be greatly increased, the wheel making fifty turns in a minute ; but then it will not continue moving so long. These wheels may be applied, perhaps, to the ringing of chimes,¹ and moving of light-made orreries.

23. A small wire bent circularly, with a loop at each end ; let one end rest against the under surface of the wheel, and bring the other end near the upper surface, it will give a terrible crack, and the force will be discharged.

24. Every spark in that manner drawn from the surface of the wheel, makes a round hole in the gilding, tearing off a part of it in coming out ; which shows that the fire is not accumulated on the gilding, but is in the glass itself.

25. The gilding being varnished over with turpentine varnish, the varnish, though dry and hard, is burnt by the spark drawn through it, and gives a

¹ This was afterwards done with success by Mr. Kinnersley.—F.

strong smell and visible smoke. And when the spark is drawn through paper, all round the hole made by it the paper will be blacked by the smoke, which sometimes penetrates several of the leaves. Part of the gilding torn off is also found forcibly driven into the hole made in the paper by the stroke.

26. It is amazing to observe in how small a portion of glass a great electrical force may lie. A thin glass bubble, about an inch diameter, weighing only six grains, being half filled with water, partly gilt on the outside, and furnished with a wire hook, gives, when electrified, as great a shock as a man can well bear. As the glass is thickest near the orifice, I suppose the lower half, which, being gilt, was electrified and gave the shock, did not exceed two grains ; for it appeared, when broken, much thinner than the upper half. If one of these thin bottles be electrified by the coating, and the spark taken out through the gilding, it will break the glass inwards, at the same time that it breaks the gilding outwards.

27. And allowing (for the reasons before given, § 8, 9, 10) that there is no more electrical fire in a bottle after charging than before, how great must be the quantity in this small portion of glass ! It seems as if it were of its very substance and essence. Perhaps if that due quantity of electrical fire so obstinately retained by glass could be separated from it, it would no longer be glass ; it might lose its transparency, or its brittleness, or its elasticity. Experiments may possibly be invented hereafter to discover this.

stragg Copeck,

28. We were surprised at the account, given in Mr. Watson's book, of a shock communicated through a great space of dry ground, and suspect there must be some metalline quality in the gravel of that ground ; having found that simply dry earth, rammed in a glass tube, open at both ends, and a wire hook inserted in the earth at each end, the earth and wires making part of a circuit, would not conduct the least perceptible shock ; and, indeed, when one wire was electrified, the other hardly showed any signs of its being in connexion with it.¹ Even a thoroughly wet packthread sometimes fails of conducting a shock, though it otherwise conducts electricity very well. A dry cake of ice, or an icicle held between two in a circle, likewise prevents the shock, which one would not expect, as water conducts it so perfectly well. Gilding on a new book, though at first it conducts the shock extremely well, yet fails after ten or a dozen experiments, though it appears otherwise in all respects the same, which we cannot account for.²

29. There is one experiment more which surprises us, and is not hitherto satisfactorily accounted for ; it is this. Place an iron shot on a glass stand, and let a ball of damp cork, suspended by a silk thread, hang in contact with the shot. Take a bottle in each hand, one that is electrified through the hook, the other

¹ Probably the ground is never so dry.—F.

² We afterwards found that it failed after one stroke with a large bottle ; and the continuity of the gold appearing broken, and many of its parts dissipated, the electricity could not pass the remaining parts without leaping

from part to part through the air, which always resists the motion of this fluid, and was probably the cause of the gold's not conducting so well as before ; the number of interruptions in the line of gold, making, when added together, a space larger, perhaps, than the striking distance.—F.

through the coating ; apply the giving wire to the shot, which will electrify it *positively*, and the cork shall be repelled ; then apply the requiring wire, which will take out the spark given by the other, when the cork will return to the shot ; apply the same again and take out another spark, so will the shot be electrified *negatively*, and the cork in that case shall be repelled equally as before. Then apply the giving wire to the shot and give the spark it wanted, so will the cork return ; give it another, which will be an addition to its natural quantity, so will the cork be repelled again ; and so may the experiment be repeated as long as there is any charge in the bottles. Which shows that bodies having less than the common quantity of electricity repel each other, as well as those that have more.

Chagrined a little that we have been hitherto able to produce nothing in this way of use to mankind ; and the hot weather coming on, when the electrical experiments are not so agreeable, it is proposed to put an end to them for this season, somewhat humorously, in a party of pleasure on the banks of the *Skuykill*.¹ Spirits, at the same time, are to be fired by a spark sent from side to side through the river, without any other conductor than the water ; an experiment which we some time since performed to the amazement of many.² A turkey is to be killed for our din-

¹ The river that washes one side of Philadelphia, as the Delaware does the other ; both are ornamented with the summer habitations of the citizens and the agreeable mansions of the principal people of this colony.—F,

² As the possibility of this experiment has not been easily conceived, I shall here describe it. Two iron rods, about three feet long, were planted just within the margin of the river, on the opposite sides. A thick piece of

ner by *electrical shock*, and roasted by the *electrical jack*, before a fire kindled by the *electrified bottle*; when the healths of all the famous electricians in England, Holland, France, and Germany are to be drank in *electrified bumpers*,¹ under the the discharge of guns from the *electrical battery*.

LXII.

TO PETER COLLINSON.

SIR :—Non-electric bodies, that have electric fire thrown into them, will retain it till other electrics, that have less, approach; and then it is communicated by a snap, and becomes equally divided.

2. Electrical fire loves water, is strongly attracted by it, and they can subsist together.

3. Air is an electric *per se*, and when dry will not conduct the electrical fire; it will neither receive it, nor give it to other bodies; otherwise no body sur-

wire, with a small round knob at its end, was fixed on the top of one of the rods, bending downwards, so as to deliver commodiously the spark upon the surface of the spirit. A small wire fastened by one end to the handle of the spoon, containing the spirit, was carried across the river and supported in the air by the rope commonly used to hold by in drawing the ferry-boats over. The other end of this wire was tied round the coating of the bottle; which being charged, the spark was delivered from the hook to the top of the rod standing in the water on that side. At the same instant the rod on the other side delivered a spark into the spoon and fired the spirit; the electric fire returning to the coating of the bottle, through the handle of the spoon and

the supported wire connected with them.

That the electric fire thus actually passes through the water, has since been satisfactorily demonstrated to many by an experiment of Mr. Kinnersley's, performed in a trough of water about ten feet long. The hand, being placed under water in the direction of the spark (which always takes the straight or shortest course, if sufficient, and other circumstances are equal), is struck and penetrated by it as it passes.—F.

¹ An *electrified bumper* is a small, thin, glass tumbler, nearly filled with wine, and electrified as the bottle. This when brought to the lips gives a shock, if the party be close shaved, and does not breathe on the liquor.—April 29, 1749.—F.

rounded by air could be electrified positively and negatively ; for, should it be attempted positively, the air would immediately take away the overplus ; or negatively, the air would supply what was wanting.

4. Water being electrified, the vapors arising from it will be equally electrified, and floating in the air, in the form of clouds, or otherwise, will retain that quantity of electrical fire, till they meet with other clouds or bodies not so much electrified, and then will communicate as before mentioned.

5. Every particle of matter electrified is repelled by every other particle equally electrified. Thus the stream of a fountain, naturally dense and continual, when electrified, will separate and spread in the form of a brush, every drop endeavouring to recede from every other drop. But on taking out the electrical fire they close again.

6. Water being strongly electrified (as well as when heated by common fire) rises in vapors more copiously ; the attraction of cohesion among its particles being greatly weakened by the opposite power of repulsion introduced with the electrical fire ; and, when any particle is by any means disengaged, it is immediately repelled, and so flies into the air.

7. Particles happening to be situated as *A* and *B* (Pl. I., Fig. 6, *representing the profile of a vessel of water*) are more easily disengaged than *C* and *D*, as each is held by contact with three only, whereas *C* and *D* are each in contact with nine. When the surface of the water has the least motion, particles are continually pushed into the situation represented by *A* and *B*.

8. Friction between a non-electric and an electric *per se* will produce electrical fire, not by *creating*, but *collecting* it, for it is equally diffused in our walls, floors, earth, and the whole mass of common matter. Thus the whirling glass globe, during its friction against the cushion, draws fire from the cushion, the cushion is supplied from the frame of the machine, that from the floor on which it stands. Cut off the communication by thick glass or wax, placed under the cushion, and no fire can be *produced*, because it cannot be *collected*.

9. The ocean is a compound of water—a non-electric, and salt—an electric *per se*.

10. When there is a friction among the parts near its surface the electrical fire is collected from the parts below. It is then plainly visible in the night ; it appears in the stern and in the wake of every sailing vessel ; every dash of an oar shows it, and every surf and spray ; in storms the whole sea seems on fire. The detached particles of water then repelled from the electrified surface continually carry off the fire as it is collected ; they arise and form clouds, and those clouds are highly electrified and retain the fire till they have an opportunity of communicating it.

11. The particles of water, rising in vapors, attach themselves to particles of air.

12. The particles of air are said to be hard, round, separate, and distant from each other, every particle strongly repelling every other particle, whereby they recede from each other as far as common gravity will permit.

13. The space between any three particles equally repelling each other will be an equilateral triangle.

14. In air compressed these triangles are smaller, in rarefied air they are larger.

15. Common fire joined with air increases the repulsion, enlarges the triangles, and thereby makes the air specifically lighter. Such air among denser air will rise.

16. Common fire as well as electrical fire gives repulsion to the particles of water, and destroys their attraction of cohesion; hence common fire as well as electrical fire assists in raising vapors.

17. Particles of water having no fire in them mutually attract each other. Three particles of water, then, being attached to the three particles of a triangle of air, would, by their mutual attraction operating against the air's repulsion, shorten the sides and lessen the triangle, whereby that portion of air made denser would sink to the earth with its water and not rise to the formation of a cloud.

18. But if every particle of water attaching itself to air brings with it a particle of common fire, the repulsion of the air being assisted and strengthened by the fire more than obstructed by the mutual attraction of the particles of water, the triangle dilates, and that portion of air, becoming rarer and specifically lighter, rises.

19. If the particles of water bring electrical fire when they attach themselves to air, the repulsion between the particles of water electrified, joins with the natural repulsion of the air to force its particles to a

greater distance, whereby the triangles are dilated, and the air rises, carrying up with it the water.

20. If the particles of water bring with them portions of *both sorts* of fire, the repulsion of the particles of air is still more strengthened and increased and the triangles farther enlarged.

21. One particle of air may be surrounded by twelve particles of water of equal size with itself, all in contact with it, and by more added to those.

22. Particles of air thus loaded would be drawn nearer together by the mutual attraction of the particles of water, did not the fire, common or electrical, assist their repulsion.

23. If air thus loaded be compressed by adverse winds or by being driven against mountains, &c., or condensed by taking away the fire that assisted it in expanding, the triangles contract, the air with its water will descend as a dew; or if the water surrounding one particle of air comes in contact with the water surrounding another, they coalesce and form a drop, and we have rain.

24. The sun supplies (or seems to supply) common fire to vapors, whether raised from earth or sea.

25. Those vapors, which have both common and electrical fire in them are better supported than those which have only common fire in them; for when vapors rise into the coldest region above the earth, the cold will not diminish the electrical fire, if it doth the common.

26. Hence clouds, formed by vapors raised from fresh waters within land, from growing vegetables,

moist earth, &c., more speedily and easily deposit their water, having but little electrical fire to repel and keep the particles separate. So that the greatest part of the water raised from the land is let fall on the land again ; and winds blowing from the land to the sea are dry, there being little use for rain on the sea, and to rob the land of its moisture, in order to rain on the sea, would not appear reasonable.

27. But clouds formed by vapors raised from the sea, having both fires, and particularly a great quantity of the electrical, support their water strongly, raise it high, and being moved by winds, may bring it over the middle of the broadest continent from the middle of the widest ocean.

28. How these ocean clouds, so strongly supporting their water, are made to deposit it on the land where it is wanted, is next to be considered.

29. If they are driven by winds against mountains, those mountains, being less electrified, attract them, and on contact take away their electrical fire (and, being cold, the common fire also) ; hence the particles close towards the mountains and towards each other. If the air was not much loaded, it only falls in dews on the mountain tops and sides, forms springs, and descends to the vales in rivulets, which, united, make larger streams and rivers. If much loaded, the electrical fire is at once taken from the whole cloud ; and, in leaving it, flashes brightly and cracks loudly, the particles instantly coalescing for want of that fire, and falling in a heavy shower.

30. When a ridge of mountains thus dams the

clouds and draws the electrical fire from the cloud first approaching it, that which next follows, when it comes near the first cloud, now deprived of its fire, flashes into it, and begins to deposit its own water, the first cloud again flashing into the mountains; the third approaching cloud, and all succeeding ones, acting in the same manner as far back as they extend, which may be over many hundred miles of country.

31. Hence the continual storms of rain, thunder, and lightning on the east side of the Andes, which, running north and south, and being vastly high, intercept all the clouds brought against them from the Atlantic ocean by the trade winds, and oblige them to deposit their waters, by which the vast rivers Amazons, La Plata, and Oroonoko are formed, which return the water into the same sea, after having fertilized a country of very great extent.

32. If a country be plain, having no mountains to intercept the electrified clouds, yet it is not without means to make them deposit their water. For if an electrified cloud coming from the sea, meets in the air a cloud raised from the land, and therefore not electrified, the first will flash its fire into the latter, and thereby both clouds shall be made suddenly to deposit water.

33. The electrified particles of the first cloud close when they lose their fire; the particles of the other clouds close in receiving it; in both, they have thereby an opportunity of coalescing into drops. The concussion or jerk given to the air contributes also

to shake down the water, not only from those two clouds, but from others near them. Hence the sudden fall of rain immediately after flashes of lightning.

34. To show this by an easy experiment ; take two round pieces of pasteboard, two inches diameter ; from the centre and circumference of each of them suspend, by fine silk threads eighteen inches long, seven small balls of wood, or seven peas equal in goodness ; so with the balls, appending to each pasteboard, form equal equilateral triangles, one ball being in the centre, and six at equal distances from that and from each other ; and thus they represent particles of air. Dip both sets in water, and some adhering to each ball, they will represent air loaded. Dexterously electrify one set, and its balls will repel each other to a greater distance, enlarging the triangles. Could the water supported by seven balls come into contact, it would form a drop or drops so heavy as to break the cohesion it had with the balls, and so fall. Let the two sets then represent two clouds, the one a sea cloud electrified, the other a land cloud. Bring them within the sphere of attraction, and they will draw towards each other, and you will see the separated balls close thus : the first electrified ball that comes near an unelectrified ball by attraction, joins it, and gives it fire ; instantly they separate, and each flies to another ball of its own party, one to give, the other to receive fire ; and so it proceeds through both sets, but so quick as to be in a manner instantaneous. In the cohesion they shake off and drop their water, which represents rain.

35. Thus, when the sea and land clouds would pass at too great a distance for the flash, they are attracted towards each other till within that distance ; for the sphere of electrical attraction is far beyond the distance of flashing.

36. When a great number of clouds from the sea meet a number of clouds raised from the land, the electrical flashes appear to strike in different parts ; and as the clouds are jostled and mixed by the winds, or brought near by the electrical attraction, they continue to give and receive flash after flash, till the electrical fire is equally diffused.

37. When the gun-barrel (in electrical experiments) has but little electrical fire in it, you must approach it very near with your knuckle before you can draw a spark. Give it more fire, and it will give a spark at a greater distance. Two gun-barrels united, and as highly electrified, will give a spark at a still greater distance. But if two gun-barrels electrified will strike at two inches distance, and make a loud snap, to what a great distance may ten thousand acres of electrified cloud strike and give its fire, and how loud must be that crack ?

38. It is a common thing to see clouds at different heights passing different ways, which shows different currents of air, one under the other. As the air between the tropics is rarefied by the sun, it rises, the denser northern and southern air pressing into its place. The air, so rarefied and forced up, passes northward and southward, and must descend into the polar regions, if it has no opportunity before, that the circulation may be carried on.

39. As currents of air, with the clouds therein, pass different ways, it is easy to conceive how the clouds, passing over each other, may attract each other, and so come near enough for the electrical stroke. And also how electrical clouds may be carried within land very far from the sea, before they have an opportunity to strike.

40. When the air, with its vapors raised from the ocean between the tropics, comes to descend in the polar regions, and to be in contact with the vapors arising there, the electrical fire they brought begins to be communicated, and is seen in clear nights, being first visible where it is first in motion—that is, where the contact begins, or in the most northern part ; from thence the streams of light seem to shoot southerly, even up to the zenith of northern countries. But though the light seems to shoot from the north southerly, the progress of the fire is really from the south northerly, its motion beginning in the north being the reason that it is there seen first.

For the electrical fire is never visible but when in motion and leaping from body to body, or from particle to particle, through the air. When it passes through dense bodies it is unseen. When a wire makes part of the circle in the explosion of the electrical phial, the fire, though in great quantity, passes in the wire invisibly ; but in passing along a chain, it becomes visible as it leaps from link to link. In passing along leaf gilding it is visible, for the leaf gold is full of pores ; hold a leaf to the light, and it appears like a net, and the fire is seen in its leaping over the

vacancies. And as when a long canal filled with still water is opened at one end, in order to be discharged, the motion of the water begins first near the opened end, and proceeds towards the close end, though the water itself moves from the close toward the opened end, so the electrical fire discharged into the polar regions, perhaps from a thousand leagues length of vaporized air, appears first where it is first in motion—that is, in the most northern part, and the appearance proceeds southward, though the fire really moves northward. This is supposed to account for the *aurora borealis*.

41. When there is great heat on the land in a particular region (the sun having shone on it perhaps several days, while the surrounding countries have been screened by clouds), the lower air is rarefied, and rises; the cooler, denser air above descends; the clouds in that air meet from all sides, and join over the heated place; and if some are electrified, others not, lightning and thunder succeed, and showers fall. Hence, thunder-gusts after heats, and cool air after gusts; the water and the clouds that bring it coming from a higher and therefore a cooler region.

42. An electrical spark drawn from an irregular body at some distance is scarcely ever straight, but shows crooked and waving in the air. So do the flashes of lightning, the clouds being very irregular bodies.

43. As electrified clouds pass over a country, high hills and high trees, lofty towers, spires, masts of ships, chimneys, &c., as so many prominences and

points draw the electrical fire, and the whole cloud discharges there.

44. Dangerous, therefore, is it to take shelter under a tree during a thunder-gust. It has been fatal to many, both men and beasts.

45. It is safer to be in the open field for another reason. When the clothes are wet, if a flash in its way to the ground should strike your head, it may run in the water over the surface of your body ; whereas, if your clothes were dry, it would go through the body, because the blood and other humors, containing so much water, are more ready conductors.

Hence a wet rat cannot be killed by the exploding electrical bottle, when a dry rat may.¹

46. Common fire is in all bodies, more or less, as well as electrical fire. Perhaps they may be different modifications of the same element ; or they may be different elements. The latter is by some suspected.

47. If they are different things, yet they may and do subsist together in the same body.

48. When electrical fire strikes through a body, it acts upon the common fire contained in it, and puts that fire in motion ; and if there be a sufficient quantity of each kind of fire, the body will be inflamed.

49. When the quantity of common fire in the body is small, the quantity of the electrical fire (or the electrical stroke) should be greater ; if the quantity of common fire be great, less electrical fire suffices to produce the effect.

¹ This was tried with a bottle containing about a quart. It is since thought that one of the large glass

jars mentioned in these papers might have killed him, though wet.—F.

50. Thus spirits must be heated before we can fire them by the electrical spark.¹ If they are much heated, a small spark will do ; if not, the spark must be greater.

51. Till lately, we could only fire warm vapors ; but now we can burn hard, dry rosin. And when we can procure greater electrical sparks, we may be able to fire, not only unwarmed spirits, as lightning does, but even wood, by giving sufficient agitation to the common fire contained in it, as friction we know will do.

52. Sulphureous and inflammable vapors arising from the earth are easily kindled by lightning. Besides what arise from the earth, such vapors are sent out by stacks of moist hay, corn, or other vegetables, which heat and reek. Wood, rotting in old trees or buildings, does the same. Such are therefore easily and often fired.

53. Metals are often melted by lightning, though perhaps not from heat in the lightning, nor altogether from agitated fire in the metals. For, as whatever body can insinuate itself between the particles of metal, and overcome the attraction by which they cohere (as sundry *menstrua* can), will make the solid become a fluid, as well as fire, yet without heating it ; so the electrical fire, or lightning, creating a violent repulsion between the particles of the metal it passes through, the metal is fused.

54. If you would, by a violent fire, melt off the end

¹ We have since fired spirits without heating them, when the weather is warm. A little, poured into the palm of

the hand, will be warmed sufficiently by the hand, if the spirit be well rectified. Ether takes fire most readily.—F.

of a nail which is half driven into a door, the heat given the whole nail, before a part would melt, must burn the board it sticks in ; and the melted part would burn the floor it dropped on. But if a sword can be melted in the scabbard, and money in a man's pocket by lightning, without burning either, it must be a cold fusion.¹

55. Lightning rends some bodies. The electrical spark will strike a hole through a quire of strong paper.

56. If the source of lightning assigned in this paper be the true one, there should be little thunder heard at sea far from land. And accordingly some old sea-captains, of whom inquiry has been made, do affirm, that the fact agrees perfectly with the hypothesis ; for that, in crossing the great ocean, they seldom meet with thunder till they come into soundings ; and that the islands far from the continent have very little of it. And a curious observer, who lived thirteen years at Bermudas, says there was less thunder there in that time than he has sometimes heard in a month at Carolina.

LXIII.

TO GEORGE WHITEFIELD.

PHILADELPHIA, 6 July, 1749.

DEAR SIR :—Since your being in England, I have received two of your favours, and a box of books to

¹ These facts, though related in several accounts, are now doubted ; since it has been observed that the parts of a bell-wire which fell on the floor, being broken and partly melted by lightning,

did actually burn into the boards. (See “Philosophical Transactions,” Vol. LI., Part I.) And Mr. Kinnersley has found that a fine iron wire, melted by electricity, has had the same effect.—F.

be disposed of. It gives me great pleasure to hear of your welfare, and that you purpose soon to return to America.

We have no kind of news here worth writing to you. The affair of the building remains in *statu quo*, there having been no new application to the Assembly about it, or any thing done in consequence of the former.

I have received no money on your account from Mr. Thanklin, or from Boston. Mrs. Read,¹ and your other friends here, in general, are well, and will rejoice to see you again.

I am glad to hear that you have frequent opportunities of preaching among the great. If you can gain them to a good and exemplary life, wonderful changes will follow in the manners of the lower ranks; for *ad exemplum regis*, etc. On this principle, Confucius, the famous Eastern reformer, proceeded. When he saw his country sunk in vice, and wickedness of all kinds triumphant, he applied himself first to the grandees; and having, by his doctrine, won *them* to the cause of virtue, the commons followed in multitudes. The mode has a wonderful influence on mankind; and there are numbers who, perhaps, fear less the being in hell, than out of the fashion. Our most western reformatations began with the ignorant mob; and when numbers of them were gained, interest and party views drew in the wise and great. Where both methods can be used, reformatations are likely to be more speedy. O that some method could be found

¹ Franklin's wife was a Miss Read.

to make them lasting! He who discovers that will, in my opinion, deserve more, ten thousand times, than the inventor of the longitude.

My wife and family join in the most cordial salutations to you and good Mrs. Whitefield.

I am, dear Sir, your very affectionate friend, and most obliged humble servant,

BENJAMIN FRANKLIN.

LXIV.

TO MRS. ABIAH FRANKLIN, AT BOSTON.

PHILADELPHIA, 7 September, 1749.

HONORED MOTHER :

We received your kind letter by this post, and are glad you still continue to enjoy such a share of health. Cousin Josiah and his spouse arrived hearty and well last Saturday noon. I met them the evening before at Trenton, thirty miles off, and accompanied them to town. They went into their own house on Monday, and I believe will do very well, for he seems bent on industry, and she appears a discreet, notable young woman. My wife has been to see them every day, calling in as she passes by ; and I suspect has fallen in love with our new cousin, for she entertains me a deal, when she comes home, with what cousin Sally does, and what cousin Sally says, what a good contriver she is, and the like.

I believe it might be of service to me, in the matter of getting in my debts, if I were to make a voyage to London ; but I have not yet determined

on it in my own mind, and think I am grown almost too lazy to undertake it.

The Indians are gone homewards loaded with presents. In a week or two the treaty with them will be printed, and I will send you one. My love to brother and sister Mecom, and to all inquiring friends. I am your dutiful son,

B. FRANKLIN.

LXV.

TO MRS. ABIAH FRANKLIN.

PHILADELPHIA, 16 October, 1749.

HONORED MOTHER :

This has been a busy day with your daughter, and she is gone to bed much fatigued and cannot write.

I send you enclosed one of our new Almanacs. We print them early, because we send them to many places far distant. I send you also a moidore enclosed, which please to accept towards chaise hire, that you may ride warm to meetings this winter. Pray tell us what kind of a sickness you have had in Boston this summer. Besides the measles and flux, which have carried off many children, we have lost some grown persons, by what we call the *Yellow Fever*; though that is almost, if not quite over, thanks to God, who has preserved all our family in perfect health.

Here are cousins Coleman, and two Folgers, all well. Your granddaughter is the greatest lover of her book and school of any child I ever knew, and is very dutiful to her mistress as well as to us.

I doubt not but brother Mecom will send the collar, as soon as he can conveniently. My love to him, sister, and all the children. I am your dutiful son,

B. FRANKLIN.

LXVI.

TO MRS. ABIAH FRANKLIN.

[Date uncertain.]

HONORED MOTHER :

We received your kind letter of the 2d instant, by which we are glad to hear you still enjoy such a measure of health, notwithstanding your great age. We read your writing very easily. I never met with a word in your letters but what I could easily understand ; for, though the hand is not always the best, the sense makes every thing plain. My leg, which you inquire after, is now quite well. I shall keep these servants ; but the man not in my own house. I have hired him out to the man that takes care of my Dutch printing-office, who agrees to keep him in victuals and clothes, and to pay me a dollar a week for his work. The wife, since that affair, behaves exceeding well ; but we conclude to sell them both the first good opportunity, for we do not like negro servants. We got again about half what we lost.

As to your grandchildren, Will is now nineteen years of age, a tall, proper youth, and much of a beau. He acquired a habit of idleness on the Expedition,¹ but begins of late to apply himself to business, and I

¹ His son, William, had been an officer in the Pennsylvania forces raised

for an expedition against Canada, in the year 1746.

hope will become an industrious man. He imagined his father had got enough for him, but I have assured him that I intend to spend what little I have myself, if it please God that I live long enough; and, as he by no means wants acuteness, he can see by my going on that I mean to be as good as my word.

Sally grows a fine girl, and is extremely industrious with her needle, and delights in her work. She is of a most affectionate temper, and perfectly dutiful and obliging to her parents, and to all. Perhaps I flatter myself too much, but I have hopes that she will prove an ingenious, sensible, notable, and worthy woman, like her aunt Jenny. She goes now to the dancing-school.

For my own part, at present, I pass my time agreeably enough. I enjoy, through mercy, a tolerable share of health. I read a great deal, ride a little, do a little business for myself, now and then for others, retire when I can, and go into company when I please; so the years roll round, and the last will come, when I would rather have it said, *He lived usefully*, than *He died rich*.

Cousins Josiah and Sally are well, and I believe will do well, for they are an industrious loving young couple; but they want a little more stock to go on smoothly with their business.

My love to brother and sister Mecom, and their children, and to all my relations in general. I am your dutiful son,

B. FRANKLIN.

LXVII.

TO PETER COLLINSON.¹

SIR :—According to your request, I now send you the arithmetical curiosity, of which this is the history.

Being one day in the country, at the house of our common friend, the late learned Mr. Logan, he showed me a folio French book filled with magic squares, wrote, if I forget not, by one M. Frenicle, in which, he said, the author had discovered great ingenuity and dexterity in the management of numbers; and though several other foreigners had distinguished themselves in the same way, he did not recollect that any one Englishman had done any thing of the kind remarkable.

I said it was, perhaps, a mark of the good sense of our English mathematicians, that they would not spend their time in things that were merely *difficiles nugæ*, incapable of any useful application. He answered, that many of the arithmetical or mathematical questions publicly proposed and answered in England were equally trifling and useless. “Perhaps the considering and answering such questions,” I replied, “may not be altogether useless, if it produces by practice an habitual readiness and exactness in mathematical disquisitions, which readiness may, on many occasions, be of real use.” “In the same way,” says he, “may the making of these squares be of use.”

¹In a letter from James Logan to Mr. Collinson, dated February 14, 1750, he says: “Our Benjamin Franklin is certainly an extraordinary man, one of a singular good judgment, but of equal modesty. He is clerk of our

Assembly, and there, for want of other employment, while he sat idle, he took it into his head to think of *magical squares*, in which he outdid Frenicle himself, who published above eighty pages in folio on that subject alone.”

MAGICAL SQUARES.

Fig. 2.

200	217	232	249	8	25	40	57	72	89	101	121	136	153	168	181
58	39	26	7	250	231	248	199	186	167	151	135	122	103	90	71
198	219	230	251	6	27	38	59	70	91	102	123	134	155	166	187
60	37	28	5	252	229	220	197	188	165	156	133	124	101	92	69
201	216	233	248	9	24	41	56	73	88	105	120	137	152	169	184
55	42	23	10	247	234	245	202	183	170	154	138	119	106	87	74
20	244	235	246	11	22	43	54	75	86	107	118	130	150	171	182
53	44	21	12	245	236	243	204	181	172	140	140	117	108	85	76
205	212	237	241	13	20	45	52	77	84	109	110	111	143	173	180
51	46	19	14	243	238	241	206	179	174	117	112	115	110	89	78
207	210	239	242	15	18	17	50	79	82	111	114	113	116	175	178
49	48	17	16	241	240	209	208	177	176	115	114	113	112	81	80
106	221	228	253	4	29	36	61	68	93	100	125	132	137	164	180
62	35	30	3	254	227	222	195	190	163	158	131	126	99	94	87
194	223	226	251	2	31	34	63	66	95	98	127	130	159	162	191
64	33	32	1	256	225	224	193	192	161	160	129	128	97	96	85

Fig. 1.

32	61	4	13	20	29	36	15
14	3	62	51	46	35	30	19
53	60	5	12	21	28	37	44
11	6	59	54	43	38	27	22
55	58	7	10	23	26	39	42
9	8	57	56	41	40	25	24
50	63	2	15	18	31	34	17
16	1	64	49	48	33	32	17

I then confessed to him that in my younger days, having once some leisure (which I still think I might have employed more usefully), I had amused myself in making this kind of magic squares, and at length had acquired such a knack at it that I could fill the cells of any magic square of reasonable size with a series of numbers as fast as I could write them, disposed in such a manner as that the sums of every row, horizontal, perpendicular, or diagonal, should be equal; but not being satisfied with these, which I looked on as common and easy things, I had imposed on myself more difficult tasks, and succeeded in making other magic squares, with a variety of properties, and much more curious. He then showed me several in the same book of an uncommon and more curious kind; but as I thought none of them equal to some I remembered to have made, he desired me to let him see them; and, accordingly, the next time I visited him I carried him a square of eight, which I found among my old papers, and which I will now give you, with an account of its properties. (See Plate II., Fig. 1.)

The properties are :

1. That every straight row (horizontal or vertical) of eight numbers added together makes 260, and half each row half 260.

2. That the bent row of eight numbers, ascending and descending diagonally, viz., from 16 ascending to 10, and from 23 descending to 17; and every one of its parallel bent rows of eight numbers, make 260. Also the bent row from 52 descending to 54, and from 43 ascending to 45, and every one of its parallel

bent rows of eight numbers, make 260. Also the bent row from 45 to 43, descending to the left, and from 23 to 17, descending to the right, and every one of its parallel bent rows of eight numbers, make 260. Also the bent row from 52 to 54, descending to the right, and from 10 to 16, descending to the left, and every one of its parallel bent rows of eight numbers, make 260. Also the parallel bent rows next to the above-mentioned, which are shortened to three numbers ascending and three descending, &c., as from 53 to 4 ascending, and from 29 to 44 descending, make, with the two corner numbers, 260. Also the two numbers, 14, 61, ascending, and 36, 19, descending, with the lower four numbers situated like them, viz., 50, 1, descending, and 32, 47, ascending, make 260. And, lastly, the four corner numbers, with the four middle numbers, make 260.

So this magical square seems perfect in its kind. But these are not all its properties; there are five other curious ones, which, at some other time, I will explain to you.

Mr. Logan then showed me an old arithmetical book, in quarto, wrote, I think, by one Stifelius, which contained a square of sixteen, that he said he should imagine must have been a work of great labor; but, if I forget not, it had only the common properties of making the same sum, viz., 2056, in every row, horizontal, vertical, and diagonal. Not willing to be outdone by Mr. Stifelius, even in the size of my square, I went home and made that evening the following magical square of sixteen, which,

besides having all the properties of the foregoing square of eight—that is, it would make the 2056 in all the same rows and diagonals, had this added, that a four-square hole being cut in a piece of paper of such a size as to take in and show through it just sixteen of the little squares, when laid on the greater square, the sum of the sixteen numbers, so appearing through the hole, wherever it was placed on the greater square, should likewise make 2056. This I sent to our friend the next morning, who, after some days, sent it back in a letter with these words : “ I return to thee thy astonishing or most stupendous piece of the magical square, in which ”—but the compliment is too extravagant, and therefore, for his sake, as well as my own, I ought not to repeat it. Nor is it necessary ; for I make no question but you will readily allow this square of sixteen to be the most magically magical of any magic square ever made by any magician. (See Plate II., Fig. 2.)

I did not, however, end with squares, but composed also a magic circle consisting of eight concentric circles and eight radial rows, filled with a series of numbers from 12 to 75 inclusive, so disposed as that the numbers of each circle, or each radial row, being added to the central number 12, they make exactly 360, the number of degrees in a circle, and this circle had, moreover, all the properties of the square of eight. If you desire it I will send it, but at present I believe you have enough on this subject.

I am, &c.,

B. FRANKLIN.

LXVIII.

TO PETER COLLINSON.

Magical Circle.

SIR :—I am glad the perusal of the magical squares afforded you any amusement. I now send you the magical circle. (See Plate III.)

Its properties, besides those mentioned in my former, are these :

Half the numbers in any radial row added with half the central number, make 180, equal to the number of degrees in a semicircle.

Also half the numbers in any one of the concentric circles, taken either above or below the horizontal double line, with half the central number, make 180.

And if any four adjoining numbers, standing nearly in a square, be taken from any part and added with half the central number, they make 180.

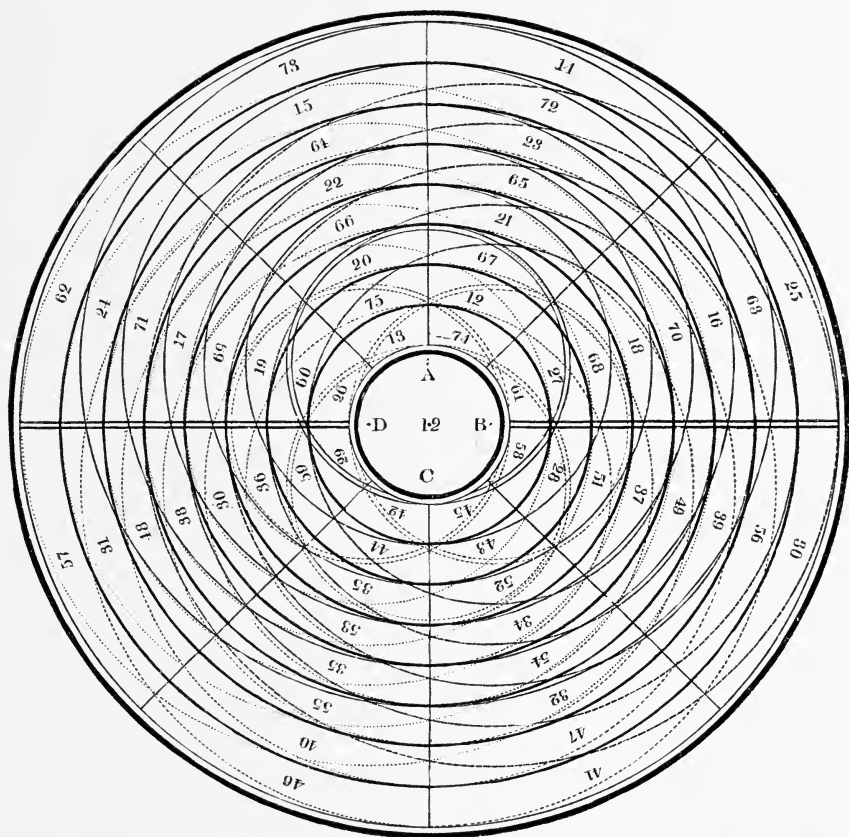
There are, moreover, included four other sets of circular spaces, eccentric with respect to the first, each of these sets containing five spaces. The centres of the circles that bound them, are at *A*, *B*, *C*, and *D*. Each set, for the more easy distinguishing them from the first, are drawn with a different colored ink, red, blue, green, and yellow.¹

These sets of eccentric circular spaces intersect those of the concentric, and each other, and yet the number contained in each of the twenty eccentric spaces, taken all around, make, with the central

¹ In the plate they are distinguished by dashed or dotted lines, as different as the engraver could well make them.—F.

PLATE III.

MAGIC CIRCLE OF CIRCLES.



number, the same sum as those in each of the eight concentric, viz., 360. The halves also of those drawn from the centres *A* and *C*, taken above or below the double horizontal line, and of those drawn from centres *B* and *D* taken to the right or left of the vertical line, do, with half the central number, make just 180.

It may be observed, that there is not one of the numbers but what belongs at least to two of the different circular spaces ; some to three, some to four, some to five ; and yet they are all so placed as never to break the required number 360, in any of the twenty-eight circular spaces within the primitive circle.

These interwoven circles make so perplexed an appearance, that it is not easy for the eye to trace every circle of numbers one would examine, through all the maze of circles intersected by it ; but if you fix one foot of the compasses in either of the centres, and extend the other to any number in the circle you would examine belonging to that centre, the moving foot will point the others out, by passing round over all the numbers of that circle successively. I am, &c.,

B. FRANKLIN.

LXIX.

TO JARED ELIOT.

PHILADELPHIA, 13 February, 1750.

DEAR SIR :

You desire to know my thoughts about the north-east storms beginning to leeward. Some years since,

there was an eclipse of the moon at nine o'clock in the evening, which I intended to observe; but before night a storm blew up at northeast, and continued violent all night and all next day; the sky thick-clouded, dark, and rainy, so that neither moon nor stars could be seen. The storm did a great deal of damage all along the coast, for we had accounts of it in the newspapers from Boston, Newport, New York, Maryland, and Virginia; but what surprised me was to find in the Boston newspapers an account of an observation of that eclipse made there; for I thought, as the storm came from the northeast, it must have begun sooner at Boston than with us, and consequently have prevented such observation. I wrote to my brother about it, and he informed me, that the eclipse was over there an hour before the storm began. Since which I have made inquiries from time to time of travellers, and of my correspondents northeastward and southwestward, and observed the accounts in the newspapers from New England, New York, Maryland, Virginia, and South Carolina; and I find it to be a constant fact, that northeast storms begin to leeward, and are often more violent there than farther to windward. Thus the last October storm, which with you was on the 8th, began on the 7th in Virginia and North Carolina, and was most violent there.¹

¹ Professor Bache, of the University of Pennsylvania, has shown that the eclipse of the moon here alluded to happened in the evening of the 21st of October, 1743; as may be seen in his tract entitled: "An Attempt to Fix the Date of Observation of Dr. Franklin,

in Relation to the Northeast Storms of the Atlantic Coast of the United States," published in the *Journal of the Franklin Institute*, in the year 1833. It appears that Dr. Franklin was the first discoverer of the above facts respecting northeast storms.—SPARKS.

As to the reason of this, I can only give you my conjectures. Suppose a great tract of country, land and sea, to wit, Florida and the Bay of Mexico, to have clear weather for several days, and to be heated by the sun, and its air thereby exceedingly rarefied. Suppose the country northeastward, as Pennsylvania, New England, Nova Scotia, and Newfoundland, to be at the same time covered with clouds, and its air chilled and condensed. The rarefied air being lighter must rise, and the denser air next to it will press into its place ; that will be followed by the next denser air, that by the next, and so on. Thus, when I have a fire in my chimney, there is a current of air constantly flowing from the door to the chimney ; but the beginning of the motion was at the chimney, where the air being rarefied by the fire rising, its place was supplied by the cooler air that was next to it, and the place of that by the next, and so on to the door. So the water in a long sluice or mill-race, being stopped by a gate, is at rest like the air in a calm ; but as soon as you open the gate at one end to let it out, the water next the gate begins first to move, that which is next to it follows ; and so, though the water proceeds forward to the gate, the motion which began there runs backwards, if one may so speak, to the upper end of the race, where the water is last in motion. We have on this continent a long ridge of mountains running from northeast to southwest, and the coast runs the same course. These may, perhaps, contribute towards the direction of the winds, or at least influence them in some degree. If these con-

jectures do not satisfy you, I wish to have yours on the subject.

I doubt not but those mountains which you mention contain valuable mines, which time will discover. I know of but one valuable copper mine in this country, which is that of Schuyler's in the Jerseys. This yields good copper, and has turned out vast wealth to the owners. I was at it last fall, but they were not then at work. The water is grown too hard for them, and they waited for a fire-engine from England to drain their pits. I suppose they will have that at work next summer ; it costs them one thousand pounds sterling.

Colonel John Schuyler, one of the owners, has a deer park five miles round, fenced with cedar logs, five logs high, with blocks of wood between. It contains a variety of land, high and low, woodland and clear. There are a great many deer in it, and he expects in a few years to kill two hundred head a year, which will be a very profitable thing. He has likewise six hundred acres of meadow, all within bank. The mine is not far from Passaic Falls, which I went also to see. They are very curious ; the water falls seventy feet perpendicularly, as we are told ; but we had nothing to measure with.

It will be agreeable to you to hear that our subscription goes on with great success, and we suppose will exceed five thousand pounds of our currency. We have bought for the Academy the house that was built for itinerant preaching, which stands on a large lot of ground capable of receiving more build-

ings to lodge the scholars, if it should come to be a regular college. The house is one hundred feet long and seventy wide, built of brick, very strong, and sufficiently high for three lofty stories. I suppose the building did not cost less than two thousand pounds but we bought it for seven hundred and seventy-five pounds, eighteen shillings, eleven pence, and three farthings ; though it will cost us three and perhaps four hundred more to make the partitions and floors and fit up the rooms. I send you enclosed a copy of our present constitution but we expect a charter from our Proprietaries this summer, when they may probably receive considerable alterations. The paper admonishes me that it is time to conclude.

I am, Sir,

Your obliged humble servant,

B. FRANKLIN.

LXX.

TO CADWALLADER COLDEN.

PHILADELPHIA, 28 June, 1750.

SIR :—I wrote a line to you last post, and sent you some electrical observations and experiments. You formerly had those papers of mine, out of which something has been taken by Mr. Watson and inserted in the Transactions. If you have forgot the contents of those papers, I am afraid some things in that I last sent you will hardly be understood, as they depend on what went before. I send you herewith, my essay towards a new hypothesis of the cause

and effects of lightning, &c., of which you may remember some hints in my first electrical minutes. I sent this essay above a twelvemonth since to Dr. Mitchell in London, and have since heard nothing of it, which makes me doubt of its getting to hand. In some late experiments, I have not only frequently fired unwarmed spirits by the electrical stroke, but have even melted small quantities of copper, silver, and gold; and not only melted, but vitrified them, so as to incorporate them with common glass; and this without any sensible heat, which strengthens my supposition, that the melting of metals by lightning may be a cold fusion. Of these experiments I shall shortly write a particular account. I wrote to Mr. Collinson, on reading in the Transactions the accounts from Italy and Germany, of giving purges, transferring odors, &c., with the electrical effluvia, that I was persuaded they were not true. He since informs me, that Abbé Nollet, of Paris, who had tried the experiments without success, was lately at the pains to make a journey to Turin, Bologna, and Venice, to inquire into the facts, and see the experiments repeated, imagining they had there some knacks of operating that he was unacquainted with; but, to his great disappointment, found little or no satisfaction, the gentlemen there having been premature in publishing their imaginations and expectations for real experiments. Please to return me the papers when you have perused them.

My good old friend, Mr. Logan, being about three months since struck with a palsy, continues speech-

less, though he knows people, and seems in some degree to retain his memory and understanding. I fear he will not recover. Mr. Kalm¹ is gone towards Canada again, and Mr. Evans² is about to take a journey to Lake Erie, which he intends next week. Mr. Bartram continues well and hearty. I thank you for what you write concerning celestial observations. We are going on with our building for the Academy, and propose to have an observatory on the top; and, as we shall have a mathematical professor, I doubt not but we shall soon be able to send you some observations accurately made.

I am with great esteem and respect, &c.,

B. FRANKLIN.

P. S.—If you think it would be agreeable to Mr. Alexander, or any other friend in New York, to peruse these electrical papers, you may return them to me through his hands.

LXXI.

TO PETER COLLINSON.

PHILADELPHIA, 27 July, 1750.

SIR:—Mr. Watson, I believe, wrote his Observations on my last paper in haste, without having first

¹ A Swedish botanist, sent by the Swedish government, at the suggestion of Linnæus, to make a botanical tour of North America. He arrived in 1748 and returned in 1751, having travelled and collected specimens in New York, Pennsylvania, and Canada. He published an account of his travels

in Swedish in 1753–1761 in three vols. It was translated into English, Dutch, and German.—EDITOR.

² Lewis Evans, author of “Geographical, Historical, Political, Philosophical, and Mechanical Essays,” of some other tracts, and of a map of the Middle Colonies.

well considered the experiments, related in §17, which still appear to me decisive in the question, *Whether the accumulation of the electrical fire be in the electrified glass, or in the non-electric matter connected with the glass?* and to demonstrate that it is really in the glass.

As to the experiment that ingenious gentleman mentions, and which he thinks conclusive on the other side, I persuade myself he will change his opinion of it when he considers that, as one person applying the wire of the charged bottle to warm spirits in a spoon held by another person, both standing on the floor, will fire the spirits, and yet such firing will not determine whether the accumulation was in the glass or the non-electric; so the placing another person between them, standing on wax, with a basin in his hand, into which the water from the phial is poured, *while he at the instant of pouring* presents a finger of his other hand to the spirits, does not at all alter the case; the stream from the phial, the side of the basin, with the arms and body of the person on the wax, being altogether but as one long wire, reaching from the internal surface of the phial to the spirits.

June 29th, 1751. In Captain Waddell's account of the effects of lightning on his ship, I could not but take notice of the large *comazants* (as he calls them), that settled on the spintles at the top-mast heads, and burned like very large torches (before the stroke). According to my opinion, the electrical fire was then drawing off, as by points, from the cloud; the largeness of the flame betokening the great quantity of

electricity in the cloud ; and had there been a good wire communication from the spintle heads to the sea that could have conducted more freely than tarred ropes or masts of turpentine wood, I imagine there would either have been no stroke, or, if a stroke, the wire would have conducted it all into the sea without damage to the ship.

His compasses lost the virtue of the loadstone, or the poles were reversed, the north point turning to the south. By electricity we have (*here* at Philadelphia) frequently given polarity to needles, and reversed it at pleasure. Mr. Wilson, at London, tried it on too large masses and with too small force.

A shock from four large glass jars, sent through a fine sewing-needle, gives it polarity, and it will traverse when laid on water. If the needle, when struck, lies east and west, the end entered by the electric blast points north. If it lies north and south, the end that lay towards the north will continue to point north when placed on water, whether the fire entered at that end or at the contrary end.

The polarity given is strongest when the needle is struck lying north and south ; weakest, when lying east and west. Perhaps if the force was still greater, the south end, entered by the fire (when the needle lies north and south), might become the north, otherwise it puzzles us to account for the inverting of compasses by lightning ; since their needles must always be found in that situation, and by our little experiments, whether the blast entered the north and went out at the south end of the needle, or the contrary,

still the end that lay to the north should continue to point north.

In these experiments the ends of the needle are sometimes finely blued, like a watch-spring, by the electric flame. This color, given by the flash from two jars only, will wipe off, but four jars fix it, and frequently melt the needles. I send you some that have had their heads and points melted off by our mimic lightning, and a pin that had its point melted off and some part of its head and neck run. Sometimes the surface on the body of the needle is also run, and appears blistered when examined by a magnifying-glass. The jars I make use of, hold seven or eight gallons, and are coated and lined with tin-foil; each of them takes a thousand turns¹ of a globe nine inches diameter to charge it.

I send you two specimens of tin-foil melted between glass by the force of two jars only.

I have not heard that any of your European electricians have ever been able to fire gunpowder by the electric flame. We do it here in this manner: A small cartridge is filled with dry powder, hard rammed, so as to bruise some of the grains; two pointed wires are then thrust in, one at each end, the points approaching each other in the middle of the cartridge till within the distance of half an inch; then, the cartridge being placed in the circuit, when

¹ The cushion being afterwards covered with a long flap of buckskin, which might cling to the globe, and care being taken to keep that flap of a due temperature between too dry and

too moist, we found so much more of the electric fluid was obtained as that one hundred and fifty turns were sufficient. 1753.—F.

the four jars are discharged, the electric flame, leaping from the point of one wire to the point of the other within the cartridge amongst the powder, *fires it*, and the explosion of the powder is at the same instant with the crack of the discharge.

Yours, &c.,

B. FRANKLIN.

LXXII.

TO PETER COLLINSON.

PHILADELPHIA, 29 July, 1750.

SIR :—As you first put us on electrical experiments by sending to our Library Company a tube with directions how to use it, and as our honorable Proprietary enabled us to carry those experiments to a greater height by his generous present of a complete electrical apparatus, it is fit that both should know from time to time what progress we make. It was in this view I wrote and sent you my former papers on this subject, desiring that as I had not the honor of a direct correspondence with that bountiful benefactor to our library, they might be communicated to him through your hands. In the same view I write and send you this additional paper. If it happens to bring you nothing new (which may well be, considering the number of ingenious men in Europe continually engaged in the same researches), at least it will show that the instruments put into our hands are not neglected, and that if no valuable discoveries are

✓✓
✓

made by us, whatever the cause may be, it is not want of industry and application.

I am, Sir, your much obliged humble servant,

B. FRANKLIN.

Opinions and Conjectures concerning the Properties and Effects of the Electrical Matter, and the Means of Preserving Buildings, Ships, &c., from Lightning, arising from Experiments and Observations made at Philadelphia, 1749.

§ 1. The electrical matter consists of particles extremely subtile, since it can permeate common matter, even the densest metals, with such ease and freedom as not to receive any perceptible resistance.

2. If any one should doubt whether the electrical matter passes through the substance of bodies, or only over and along their surfaces, a shock from an electrified large glass jar, taken through his own body, will probably convince him.

3. Electrical matter differs from common matter in this, that the parts of the latter mutually attract, those of the former mutually repel, each other. Hence the appearing divergency in a stream of electrified effluvia.

4. But, though the particles of electrical matter do repel each other, they are strongly attracted by all other matter.¹

5. From these three things, the extreme subtilty of the electrical matter, the mutual repulsion of its

¹ See the ingenious essays on Electricity, in the Transactions, by Mr. Ellicot.—F.

parts, and the strong attraction between them and other matter, arises this effect, that, when a quantity of electrical matter is applied to a mass of common matter, of any bigness or length, within our observation (which hath not already got its quantity), it is immediately and equally diffused through the whole.

6. Thus, common matter is a kind of sponge to the electrical fluid. And as a sponge would receive no water, if the parts of water were not smaller than the pores of the sponge; and even then but slowly, if there were not a mutual attraction between those parts and the parts of the sponge; and would still imbibe it faster, if the mutual attraction among the parts of the water did not impede, some force being required to separate them; and fastest, if, instead of attraction, there were a mutual repulsion among those parts, which would act in conjunction with the attraction of the sponge; so is the case between the electrical and common matter.

7. But in common matter there is (generally) as much of the electrical as it will contain within its substance. If more is added, it lies without upon the surface, and forms what we call an electrical atmosphere; and then the body is said to be electrified.

8. It is supposed, that all kinds of common matter do not attract and retain the electrical with equal strength and force, for reasons to be given hereafter. And that those called electrics *per se*, as glass, &c., attract and retain it strongest, and contain the greatest quantity.

9. We know, that the electrical fluid is *in* common

matter, because we can pump it *out* by the globe or tube. We know that common matter has near as much as it can contain, because, when we add a little more to any portion of it, the additional quantity does not enter, but forms an electrical atmosphere. And we know, that common matter has not (generally) more than it can contain, otherwise all loose portions of it would repel each other, as they constantly do when they have electric atmospheres.

10. The beneficial uses of this electric fluid in the creation we are not yet well acquainted with, though doubtless such there are, and those very considerable ; but we may see some pernicious consequences that would attend a much greater proportion of it. For, had this globe we live on as much of it in proportion as we can give to a globe of iron, wood, or the like, the particles of dust and other light matters that get loose from it would, by virtue of their separate electrical atmospheres, not only repel each other, but be repelled from the earth, and not easily be brought to unite with it again ; whence our air would continually be more and more clogged with foreign matter and grow unfit for respiration. This affords another occasion of adoring that wisdom which has made all things by weight and measure !

11. If a piece of common matter be supposed entirely free from electrical matter, and a single particle of the latter be brought nigh, it will be attracted and enter the body, and take place in the centre, or where the attraction is every way equal. If more particles enter, they take their places where the

balance is equal between the attraction of the common matter and their own mutual repulsion. It is supposed they form triangles, whose sides shorten as their number increases, till the common matter has drawn in so many that its whole power of compressing those triangles by attraction is equal to their whole power of expanding themselves by repulsion ; and then will such a piece of matter receive no more.

12. When part of this natural proportion of electrical fluid is taken out of a piece of common matter, the triangles formed by the remainder are supposed to widen, by the mutual repulsion of the parts, until they occupy the whole piece.

13. When the quantity of electrical fluid taken from a piece of common matter is restored again, it enters the expanded triangles, being again compressed till there is room for the whole.

14. To explain this : take two apples, or two balls of wood or other matter, each having its own natural quantity of the electrical fluid. Suspend them by silk lines from the ceiling. Apply the wire of a well-charged phial, held in your hand, to one of them (*A*) Plate I., Fig. 7, and it will receive from the wire a quantity of the electrical fluid, but will not imbibe it, being already full. The fluid, therefore, will flow round its surface and form an electrical atmosphere. Bring *A* into contact with *B*, and half the electrical fluid is communicated, so that each has now an electrical atmosphere, and therefore they repel each other. Take away these atmospheres, by touching the balls, and leave them in their natural state ; then, having

fixed a stick of sealing-wax to the middle of the phial to hold it by, apply the wire to *A*, at the same time the coating touches *B*. Thus will a quantity of the electrical fluid be drawn out of *B*, and thrown on *A*. So that *A* will have a redundance of this fluid, which forms an atmosphere round, and *B* an exactly equal deficiency. Now, bring these balls again into contact, and the electrical atmosphere will not be divided between *A* and *B*, into two smaller atmospheres as before ; for *B* will drink up the whole atmosphere of *A*, and both will be found again in their natural state.

15. The form of the electrical atmosphere is that of the body it surrounds. This shape may be rendered visible in a still air, by raising a smoke from dry rosin dropt into a hot tea-spoon under the electrified body, which will be attracted, and spread itself equally on all sides, covering and concealing the body.¹ And this form it takes, because it is attracted by all parts of the surface of the body, though it cannot enter the substance already replete. Without this attraction, it would not remain round the body, but dissipate in the air.

16. The atmosphere of electrical particles surrounding an electrified sphere is not more disposed to leave it, or more easily drawn off from any one part of the sphere than another, because it is equally attracted by every part. But that is not the case with bodies of any other figure. From a cube it is more easily drawn at the corners than at the plane sides, and so

¹ See *Supra*, p. 68.

from the angles of a body of any other form, and still most easily from the angle that is most acute. Thus if a body shaped as *A, B, C, D, E*, in Plate I., Fig. 8, be electrified, or have an electrical atmosphere communicated to it, and we consider every side as a base on which the particles rest, and by which they are attracted, one may see, by imagining a line from *A* to *F*, and another from *E* to *G*, that the portion of the atmosphere included in *F, A, E, G*, has the line *A, E* for its basis. So the portion of atmosphere included in *H, A, B, I*, has the line *A, B* for its basis. And likewise the portion included in *K, B, C, L*, has *B, C* to rest on; and so on the other side of the figure. Now, if you would draw off this atmosphere with any blunt, smooth body, and approach the middle of the side *A, B*, you must come very near, before the force of your attractor exceeds the force or power with which that side holds the atmosphere. But there is a small portion between *I, B, K*, that has less of the surface to rest on, and to be attracted by, than the neighbouring portions, while at the same time there is a mutual repulsion between its particles and the particles of those portions; therefore here you can get it with more ease, or at a greater distance. Between *F, A, H*, there is a larger portion that has yet a less surface to rest on, and to attract it; here, therefore, you can get it away still more easily. But easiest of all, between *L, C, M*, where the quantity is largest, and the surface to attract and keep it back the least. When you have drawn away one of these angular portions of the fluid, another succeeds in its

place from the nature of fluidity and the mutual repulsion before mentioned ; and so the atmosphere continues flowing off at such angle, like a stream, till no more is remaining. The extremities of the portions of atmosphere over these angular parts are likewise at a greater distance from the electrified body, as may be seen by the inspection of the above figure ; the point of the atmosphere of the angle *C* being much farther from *C*, than any other part of the atmosphere over the lines *C, B*, or *B, A* ; and besides the distance arising from the nature of the figure, where the attraction is less, the particles will naturally expand to a greater distance by their mutual repulsion. On these accounts we suppose electrified bodies discharge their atmospheres upon unelectrified bodies more easily, and at a greater distance from their angles and points than from their smooth sides. Those points will also discharge into the air, when the body has too great an electrical atmosphere, without bringing any non-electric near to receive what is thrown off. For the air, though an electric *per se*, yet has always more or less water and other non-electric matters mixed with it ; and these attract and receive what is so discharged.

17. But points have a property, by which they *draw on* as well as *throw off* the electrical fluid, at greater distances than blunt bodies can. That is, as the pointed part of an electrified body will discharge the atmosphere of that body, or communicate it farthest to another body, so the point of an unelectrified body will draw off the electrical atmosphere

from an electrified body, farther than a blunter part of the same unelectrified body will do. Thus, a pin held by the head, and the point presented to an electrified body, will draw off its atmosphere at a foot distance ; where, if the head were presented instead of the point, no such effect would follow. To understand this, we may consider that, if a person standing on the floor would draw off the electrical atmosphere from an electrified body, an iron crow and a blunt knitting-needle held alternately in his hand, and presented for that purpose, do not draw with different forces in proportion to their different masses. For the man, and what he holds in his hand, be it large or small, are connected with the common mass of unelectrified matter ; and the force with which he draws is the same in both cases, it consisting in the different proportion of electricity in the electrified body and that common mass. But the force with which the electrified body retains its atmosphere by attracting it, is proportioned to the surface over which the particles are placed ; that is, four square inches of that surface retain their atmosphere with four times the force that one square inch retains its atmosphere. And as in plucking the hairs from a horse's tail a degree of strength not sufficient to pull away a handful at once could yet easily strip it hair by hair, so a blunt body presented cannot draw off a number of particles at once, but a pointed one, with no greater force, takes them away easily, particle by particle.

18. These explanations of the power and operation

of points, when they first occurred to me, and while they first floated in my mind, appeared perfectly satisfactory ; but now I have written them, and considered them more closely, I must own I have some doubts about them ; yet, as I have at present nothing better to offer in their stead, I do not cross them out ; for, even a bad solution read, and its faults discovered, has often given rise to a good one, in the mind of an ingenious reader.

19. Nor is it of much importance to us to know the manner in which nature executes her laws ; it is enough if we know the laws themselves. It is of real use to know that China left in the air unsupported will fall and break ; but *how* it comes to fall, and *why* it breaks, are matters of speculation. It is a pleasure indeed to know them, but we can preserve our China without it.

20. Thus, in the present case, to know this power of points may possibly be of some use to mankind, though we should never be able to explain it. The following experiments, as well as those in my first paper, show this power. I have a large prime conductor, made of several thin sheets of clothier's paste-board, formed into a tube, near ten feet long and a foot diameter. It is covered with Dutch embossed paper, almost totally gilt. This large metallic surface supports a much greater electrical atmosphere than a rod of iron of fifty times the weight would do. It is suspended by silk lines, and when charged will strike, at near two inches distance, a pretty hard stroke, so as to make one's knuckle ache. Let a person stand-

ing on the floor present the point of a needle, at twelve or more inches distance from it, and while the needle is so presented, the conductor cannot be charged, the point drawing off the fire as fast as it is thrown on by the electrical globe. Let it be charged, and then present the point at the same distance, and it will suddenly be discharged. In the dark you may see the light on the point, when the experiment is made. And if the person holding the point stands upon wax, he will be electrified by receiving the fire at that distance. Attempt to draw off the electricity with a blunt body, as a bolt of iron round at the end, and smooth (a silversmith's iron punch, inch thick, is what I use), and you must bring it within the distance of three inches before you can do it, and then it is done with a stroke and crack. As the pasteboard tube hangs loose on silk lines, when you approach it with the punch-iron, it likewise will move towards the punch, being attracted while it is charged ; but if, at the same instant, a point be presented as before, it retires again, for the point discharges it. Take a pair of large brass scales, of two or more feet beam, the cords of the scales being silk. Suspend the beam by a pack-thread from the ceiling, so that the bottom of the scales may be about a foot from the floor ; the scales will move round in a circle by the untwisting of the pack-thread. Set the iron punch on the end upon the floor, in such a place as that the scales may pass over it in making their circle ; then electrify one scale by applying the wire of a charged phial to it. As they move round, you see

that scale draw nigher to the floor, and dip more when it comes over the punch ; and if that be placed at a proper distance, the scale will snap and discharge its fire into it. But if a needle be stuck on the end of the punch, its point upward, the scale, instead of drawing nigh to the punch and snapping, discharges its fire silently through the point, and rises higher from the punch. Nay, even if the needle be placed upon the floor near the punch, its point upwards, the end of the punch, though so much higher than the needle, will not attract the scale and receive its fire, for the needle will get it and convey it away before it comes nigh enough for the punch to act. And this is constantly observable in these experiments, that the greater quantity of electricity on the pasteboard tube, the farther it strikes or discharges its fire, and the point likewise will draw it off at a still greater distance.

Now if the fire of electricity and that of lightning be the same, as I have endeavoured to show at large in a former paper, this pasteboard tube and these scales may represent electrified clouds. If a tube of only ten feet long will strike and discharge its fire on the punch at two or three inches distance, an electrified cloud of perhaps ten thousand acres may strike and discharge on the earth at a proportionably greater distance. The horizontal motion of the scales over the floor may represent the motion of the clouds over the earth ; and the erect iron punch, a hill or high building ; and then we see how electrified clouds passing over hills or high buildings at too great a height to strike, may be attracted lower till within

their striking distance. And lastly, if a needle fixed on the punch with its point upright, or even on the floor below the punch, will draw the fire from the scale silently at a much greater than the striking distance, and so prevent its descending towards the punch ; or if in its course it would have come nigh enough to strike, yet being first deprived of its fire it cannot, and the punch is thereby secured from the stroke ; I say, if these things are so, may not the knowledge of this power of points be of use to mankind in preserving houses, churches, ships, &c., from the stroke of lightning, by directing us to fix on the highest parts of those edifices upright rods of iron made sharp as a needle, and gilt to prevent rusting, and from the foot of those rods a wire down the outside of the building into the ground, or down round one of the shrouds of a ship, and down her side till it reaches the water ? Would not these pointed rods probably draw the electrical fire silently out of a cloud before it came nigh enough to strike, and thereby secure us from that most sudden and terrible mischief ?

21. To determine the question whether the clouds that contain lightning are electrified or not, I would propose an experiment to be tried where it may be done conveniently. On the top of some high tower or steeple, place a kind of sentry-box (as in Plate I., Fig. 9), big enough to contain a man and an electrical stand. From the middle of the stand let an iron rod rise and pass bending out of the door, and then upright twenty or thirty feet, pointed very sharp at the end. If the electrical stand be kept clean and dry, a man stand-

ing on it when such clouds are passing low might be electrified and afford sparks, the rod drawing fire to him from a cloud. If any danger to the man should be apprehended (though I think there would be none), let him stand on the floor of his box, and now and then bring near to the rod the loop of a wire that has one end fastened to the leads, he holding it by a wax handle ; so the sparks, if the rod is electrified, will strike from the rod to the wire and not affect him.

22. Before I leave this subject of lightning, I may mention some other similarities between the effects of that and those of electricity. Lightning has often been known to strike people blind. A pigeon that we struck dead to appearance by the electrical shock, recovering life, drooped about the yard several days, ate nothing, though crumbs were thrown to it, but declined and died. We did not think of its being deprived of sight, but afterwards a pullet, struck dead in like manner, being recovered by repeatedly blowing into its lungs, when set down on the floor ran headlong against the wall, and on examination appeared perfectly blind. Hence we concluded that the pigeon also had been absolutely blinded by the shock. The biggest animal we have yet killed, or tried to kill, with the electrical stroke was a well-grown pullet.

23. Reading in the ingenious Dr. Miles's account of the thunder-storm at Stretham, the effect of the lightning in stripping off all the paint that had covered a gilt moulding of a pannel of wainscot without hurting the rest of the paint, I had a mind to lay a coat of

paint over the filleting of gold on the cover of a book, and try the effect of a strong electrical flash sent through that gold from a charged sheet of glass. But having no paint at hand, I pasted a narrow strip of paper over it, and when dry sent the flash through the gilding, by which the paper was torn off from end to end with such force that it was broken in several places, and in others brought away part of the grain of the Turkey-leather in which it was bound, and convinced me that had it been painted the paint would have been stripped off in the same manner with that on the wainscot at Stretham.

24. Lightning melts metals, and I hinted in my paper on that subject that I suspected it to be a cold fusion ; I do not mean a fusion by force of cold, but a fusion without heat. We have also melted gold, silver, and copper in small quantities by the electrical flash. The manner is this : Take leaf-gold, leaf-silver, or leaf-gilt copper, commonly called leaf-brass, or Dutch gold ; cut off from the leaf long narrow strips the breadth of a straw. Place one of these strips between two strips of smooth glass that are about the width of your finger. If one strip of gold the length of the leaf be not long enough for the glass, add another to the end of it, so that you may have a little part hanging out loose at each end of the glass. Bind the pieces of glass together from end to end with strong silk thread ; then place it so as to be part of an electrical circuit (the ends of gold hanging out being of use to join with the other parts of the circuit), and send the flash through

it, from a large electrified jar or sheet of glass. Then, if your strips of glass remain whole, you will see that the gold is missing in several places, and instead of it a metallic stain on both the glasses; the stains on the upper and under glass exactly similar in the minutest stroke, as may be seen by holding them to the light; the metal appeared to have been not only melted, but even vitrified, or otherwise so driven into the pores of the glass, as to be protected by it from the action of the strongest *aqua fortis* or *aqua regia*. I send you enclosed two little pieces of glass with these metallic stains upon them, which cannot be removed without taking part of the glass with them. Sometimes the stain spreads a little wider than the breadth of the leaf, and looks brighter at the edge, as by inspecting closely you may observe in these. Sometimes the glass breaks to pieces; once the upper glass broke into a thousand pieces, looking like coarse salt. The pieces I send you were stained with Dutch gold. True gold makes a darker stain, somewhat reddish; silver, a greenish stain. We once took two pieces of thick looking-glass, as broad as a gunter's scale, and six inches long; and, placing leaf-gold between them, put them between two smoothly-plained pieces of wood, and fixed them tight in a book-binder's small press; yet, though they were so closely confined, the force of the electrical shock shivered the glass into many pieces. The gold was melted, and stained into the glass, as usual. The circumstances of the breaking of the glass differ much in making the experiment, and sometimes it does not

break at all ; but this is constant, that the stains in the upper and under pieces are exact counterparts of each other. And though I have taken up the pieces of glass between my fingers immediately after this melting, I never could perceive the least warmth in them.

25. In one of my former papers I mentioned that gilding on a book, though at first it communicated the shock perfectly well, yet failed after a few experiments, which we could not account for. We have since found, that one strong shock breaks the continuity of the gold in the filleting, and makes it look rather like dust of gold, abundance of its parts being broken and driven off ; and it will seldom conduct above one strong shock. Perhaps this may be the reason : when there is not a perfect continuity in the circuit, the fire must leap over the vacancies ; there is a certain distance which it is able to leap over according to its strength ; if a number of small vacancies, though each be very minute, taken together exceed that distance, it cannot leap over them, and so the shock is prevented.

26. From the before-mentioned law of electricity, that points, as they are more or less acute, draw on and throw off the electrical fluid with more or less power, and at greater or less distances, and in larger or smaller quantities in the same time, we may see how to account for the situation of the leaf of gold suspended between two plates, the upper one continually electrified, the under one in a person's hand standing on the floor. When the upper plate is electrified, the leaf is attracted and raised towards

it, and would fly to that plate, were it not for its own points. The corner that happens to be uppermost when the leaf is rising, being a sharp point, from the extreme thinness of the gold, draws and receives at a distance a sufficient quantity of the electric fluid to give itself an electric atmosphere, by which its progress to the upper plate is stopped, and it begins to be repelled from that plate, and would be driven back to the under plate, but that its lowest corner is likewise a point, and throws off or discharges the overplus of the leaf's atmosphere as fast as the upper corner draws it on. Were these two points perfectly equal in acuteness, the leaf would take place exactly in the middle space, for its weight is a trifle compared to the power acting on it ; but it is generally nearest the unelectrified plate, because, when the leaf is offered to the electrified plate, at a distance, the sharpest point is commonly first affected and raised towards it ; so *that* point, from its greater acuteness, receiving the fluid faster than its opposite can discharge it at equal distances, it retires from the electrified plate and draws nearer to the unelectrified plate, till it comes to a distance where the discharge can be exactly equal to the receipt, the latter being lessened and the former increased ; and there it remains as long as the globe continues to supply fresh electrical matter. This will appear plain, when the difference of acuteness in the corners is made very great. Cut a piece of Dutch gold (which is fittest for these experiments on account of its great strength) into the form of Figure 10, the upper corner a right

angle, the two next obtuse angles, and the lowest a very acute one; and bring this on your plate, under the electrified plate, in such a manner as that the right-angled part may be first raised (which is done by covering the acute part with the hollow of your hand), and you will see this leaf take place much nearer to the upper than the under plate; because, without being nearer, it cannot receive so fast at its right-angled point as it can discharge at its acute one. Turn this leaf with the acute part uppermost, and then it takes place nearest the un-electrified plate; because otherwise it receives faster at its acute point than it can discharge at its right-angled one. Thus the difference of distance is always proportioned to the difference of acuteness. Take care, in cutting your leaf, to leave no little ragged particles on the edges, which sometimes form points where you would not have them. You may make this figure so acute below and blunt above, as to need no under plate, it discharging fast enough into the air. When it is made narrower, as the figure between the pricked lines, we call it the *golden fish*, from its manner of acting. For if you take it by the tail, and hold it at a foot or greater horizontal distance from the prime conductor, it will, when let go, fly to it with a brisk but wavering motion, like that of an eel through the water; it will then take place under the prime conductor, at perhaps a quarter or half an inch distance, and keep a continual shaking of the tail like a fish, so that it seems animated. Turn its tail towards the prime conductor, and then it flies to

your finger, and seems to nibble it. And if you hold a plate under it at six or eight inches distance, and cease turning the globe, when the electrical atmosphere of the conductor grows small, it will descend to the plate, and swim back again several times, with the same fish-like motion, greatly to the entertainment of spectators. By a little practice in blunting or sharpening the heads or tails of these figures, you may make them take place as desired, nearer or farther from the electrified plate.

27. It is said, in section eighth of this paper, that all kinds of common matter are supposed not to attract the electrical fluid with equal strength; and that those called electrics *per se*, as glass, &c., attract and retain it strongest, and contain the greatest quantity. This latter position may seem a paradox to some, being contrary to the hitherto received opinion; and therefore I shall now endeavour to explain it.

28. In order to this, let it first be considered *that we cannot, by any means we are yet acquainted with, force the electrical fluid through glass*. I know it is commonly thought that it easily pervades glass; and the experiment of a feather suspended by a thread, in a bottle hermetically sealed, yet moved by bringing a rubbed tube near the outside of the bottle, is alleged to prove it. But if the electrical fluid so easily pervades glass, how does the phial become *charged* (as we term it), when we hold it in our hands? Would not the fire, thrown in by the wire, pass through to our hands, and so escape into the floor? Would not the bottle in that case be left just as we found it, un-

charged, as we know a metal bottle so attempted to be charged would be? Indeed, if there be the least crack, the minutest solution of continuity in the glass, though it remains so tight that nothing else we know of will pass, yet the extremely subtile electric fluid flies through such a crack with the greatest freedom, and such a bottle we know can never be charged; what then makes the difference between such a bottle and one that is sound, but this, that the fluid can pass through the one and not through the other.¹

29. It is true there is an experiment that at first sight would be apt to satisfy a slight observer that the fire thrown into the bottle by the wire does really pass through the glass. It is this: Place the bottle on a glass stand under the prime conductor; suspend a bullet by a chain from the prime conductor till it comes within a quarter of an inch right over the wire of the bottle; place your knuckle on the glass stand at just the same distance from the coating of the bottle as the bullet is from its wire. Now let the globe be turned, and you see a spark strike from the bullet to the wire of the bottle, and the same instant you see and feel an exactly equal spark striking from the coating on your knuckle, and so on, spark for spark. This looks as if the whole received by the bottle was again discharged from it. And yet the bottle by this means is charged!² And therefore the fire that thus leaves the bottle, though the same in quantity, cannot be the very same fire that entered at

¹ See the first sixteen sections of the former paper, No. LXI.

² See § 10 of paper No. LXI.

the wire, for if it were, the bottle would remain uncharged.

30. If the fire that so leaves the bottle be not the same that is thrown in through the wire, it must be fire that subsisted in the bottle (that is, in the glass of the bottle) before the operation began.

31. If so there must be a great quantity in glass, because a great quantity is thus discharged, even from very thin glass.

32. That this electrical fluid or fire is strongly attracted by glass, we know from the quickness and violence with which it is resumed by the part that had been deprived of it when there is an opportunity. And by this, that we cannot from a mass of glass draw a quantity of electric fire, or electrify the whole mass *minus*, as we can a mass of metal. We cannot lessen or increase its whole quantity, for the quantity it has it holds, and it has as much as it can hold. Its pores are filled with it as full as the mutual repellency of the particles will admit, and what is already in refuses, or strongly repels, any additional quantity. Nor have we any way of moving the electrical fluid in glass, but one : that is, by covering part of the two surfaces of thin glass with non-electrics, and then throwing an additional quantity of this fluid on one surface, which, spreading in the non-electric, and being bound by it to that surface, acts by its repelling force on the particles of the electrical fluid contained in the other surface, and drives them out of the glass into the non-electric on that side from whence they are discharged, and then those added on the charged

side can enter. But when this is done there is no more in the glass, nor less, than before, just as much having left it on one side as it received on the other.

33. I feel a want of terms here, and doubt much whether I shall be able to make this part intelligible. By the word *surface*, in this case, I do not mean mere length and breadth without thickness ; but, when I speak of the upper or under surface of a piece of glass, the outer or inner surface of the phial, I mean length, breadth, and half the thickness, and beg the favor of being so understood. Now I suppose that glass, in its first principles, and in the furnace, has no more of this electrical fluid than other common matter ; that when it is blown, as it cools, and the particles of common fire leave it, its pores become a vacuum ; that the component parts of glass are extremely small and fine, I guess from its never showing a rough face when it breaks, but always a polish ; and from the smallness of its particles I suppose the pores between them must be exceedingly small, which is the reason that *aqua fortis*, nor any other menstruum we have, can enter to separate them and dissolve the substance ; nor is any fluid we know of fine enough to enter, except common fire and the electric fluid. Now the departing fire, leaving a vacuum, as aforesaid, between these pores, which air nor water are fine enough to enter and fill, the electric fluid (which is everywhere ready in what we call the non-electrics, and in the non-electric mixtures that are in the air) is attracted in ; yet does not be-

come fixed with the substance of the glass, but subsists there as water in a porous stone, retained only by the attraction of the fixed parts, itself still loose and a fluid. But I suppose farther, that, in the cooling of the glass, its texture becomes closest in the middle, and forms a kind of partition, in which the pores are so narrow that the particles of the electrical fluid, which enter both surfaces at the same time, cannot go through, or pass and repass from one surface to the other, and so mix together; yet, though the particles of electric fluid imbibed by each surface cannot themselves pass through to those of the other, their repellency can, and by this means they act on one another. The particles of the electric fluid have a mutual repellency, but by the power of attraction in the glass they are condensed or forced near to each other. When the glass has received, and by its attraction forced closer together, so much of this electric fluid, as that the power of attracting and condensing in the one, is equal to the power of expansion in the other, it can imbibe no more, and that remains its constant whole quantity; but each surface would receive more, if the repellency of what is in the opposite surface did not resist its entrance. The quantities of this fluid in each surface being equal, their repelling action on each other is equal; and therefore those of one surface cannot drive out those of the other; but if a greater quantity is forced into one surface than the glass would naturally draw in, this increases the repelling power on that side, and, overpowering the attraction on the

other, drives out part of the fluid that had been imbibed by that surface, if there be any non-electric ready to receive it ; such there is in all cases where glass is electrified to give a shock. The surface that has been thus emptied, by having its electrical fluid driven out, resumes again an equal quantity with violence, as soon as the glass has an opportunity to discharge that over quantity more than it could retain by attraction in its other surface, by the additional repellency of which the vacuum had been occasioned. For experiments favoring (if I may not say confirming) this hypothesis, I must, to avoid repetition, beg leave to refer you back to what is said of the electrical phial in my former papers.

34. Let us now see how it will account for several other appearances. Glass, a body extremely elastic (and perhaps its elasticity may be owing in some degree to the subsisting of so great a quantity of this repelling fluid in its pores), must, when rubbed, have its rubbed surface somewhat stretched, or its solid parts drawn a little farther asunder, so that the vacancies, in which the electrical fluid resides, become larger, affording room for more of that fluid, which is immediately attracted into it from the cushion or handrubbing, they being supplied from the common stock. But the instant the parts of the glass so opened and filled have passed the friction, they close again, and force the additional quantity out upon the surface, where it must rest till that part comes round to the cushion again, unless some non-electric (as the

prime conductor) first presents to receive it.¹ But if the inside of the globe be lined with a non-electric, the additional repellency of the electrical fluid thus collected by friction on the rubbed part of the globe's outer surface drives an equal quantity out of the inner surface into that non-electric lining, which, receiving it and carrying it away from the rubbed part into the common mass through the axis of the globe and frame of the machine, the new-collected electrical fluid can enter and remain in the outer surface, and none of it (or a very little) will be received by the prime conductor. As this charged part of the globe comes round to the cushion again, the outer surface delivers its overplus fire into the cushion, the opposite inner surface receiving at the same time an equal quantity from the floor. Every electrician knows that a globe wet within will afford little or no fire; but the reason has not before been attempted to be given, that I know of.

35. So, if a tube lined with a non-electric be rubbed,² little or no fire is obtained from it; what is collected from the hand in the downward rubbing stroke entering the pores of the glass, and driving an equal quantity out of the inner surface into the non-electric lining; and the hand, in passing up to take a second stroke, takes out again what had been thrown

¹ In the dark the electric fluid may be seen on the cushion in two semi-circles or half-moons, one on the fore part, the other on the back part of the cushion, just where the globe and cushion separate. In the fore crescent the fire is passing out of the cushion into the

glass; in the other it is leaving the glass and returning into the back part of the cushion. When the prime conductor is applied to take it off the glass, the back crescent disappears.—F.

² Gilt paper, with the gilt face next the glass, does well.

into the outer surface, and then the inner surface receives back again what it had given to the non-electric lining. Thus, the particles of electrical fluid belonging to the inside surface go in and out of their pores every stroke given to the tube. Put a wire into the tube, the inward end in contact with the non-electric lining, so it will represent the Leyden bottle. Let a second person touch the wire while you rub, and the fire, driven out of the inward surface when you give the stroke, will pass through him into the common mass, and return through him when the inner surface resumes its quantity, and therefore this new kind of Leyden bottle cannot be so charged. But thus it may: after every stroke, before you pass your hand up to make another, let a second person apply his finger to the wire, take the spark, and then withdraw his finger; and so on till he has drawn a number of sparks; thus will the inner surface be exhausted, and the outer surface charged; then wrap a sheet of gilt paper close round the outer surface, and grasping it in your hand you may receive a shock by applying the finger of the other hand to the wire; for now the vacant pores in the inner surface resume their quantity, and the overcharged pores in the outer surface discharge their overplus; the equilibrium being restored through your body, which could not be restored through the glass.¹ If the tube be exhausted of air, a non-electric lining in contact with the wire is not necessary; for *in vacuo* the electrical fire will fly freely from the inner surface without a non-electric

¹ See paper No. LXI., § 15.

conductor ; but air resists its motion ; for being itself an electric *per se*, it does not attract it, having already its quantity. So the air never draws off an electric atmosphere from any body, but in proportion to the non-electrics mixed with it ; it rather keeps such an atmosphere confined, which, from the mutual repulsion of its particles, tends to dissipation, and would immediately dissipate *in vacuo*. And thus the experiment of the feather enclosed in a glass vessel hermetically sealed, but moving on the approach of the rubbed tube, is explained. When an additional quantity of the electrical fluid is applied to the side of the vessel by the atmosphere of the tube, a quantity is repelled and driven out of the inner surface of that side into the vessel, and there affects the feather, returning again into its pores when the tube with its atmosphere is withdrawn ; not that the particles of that atmosphere did themselves pass through the glass to the feather. And every other appearance I have yet seen, in which glass and electricity are concerned, are, I think, explained with equal ease by the same hypothesis. Yet perhaps it may not be a true one, and I shall be obliged to him that affords me a better.

36. Thus I take the difference between non-electrics and glass, an electric *per se*, to consist in these two particulars. 1st, that a non-electric easily suffers a change in the quantity of the electric fluid it contains. You may lessen its whole quantity by drawing out a part, which the whole body will again resume ; but of glass you can only lessen the quantity contained in one of its surfaces ; and not that,

but by supplying an equal quantity at the same time to the other surface ; so that the whole glass may always have the same quantity in the two surfaces, their two different quantities being added together. And this can only be done in glass that is thin ; beyond a certain thickness we have yet no power that can make this change. And 2dly, that the electric fire freely moves from place to place in and through the substance of a non-electric, but not so through the substance of glass. If you offer a quantity to one end of a long rod of metal it receives it, and when it enters every particle that was before in the rod pushes its neighbour quite to the farther end, where the overplus is discharged ; and this instantaneously, where the rod is part of the circle in the experiment of the shock. But glass, from the smallness of its pores, or stronger attraction of what it contains, refuses to admit so free a motion ; a glass rod will not conduct a shock, nor will the thinnest glass suffer any particle entering one of its surfaces to pass through to the other.

37. Hence we see the impossibility of success in the experiments proposed to draw out the effluvial virtues of a non-electric, as cinnamon, for instance, and mixing them with the electric fluid, to convey them with that into the body by including it in the globe, and then applying friction, &c. For, though the effluvia of cinnamon and the electric fluid should mix within the globe, they would never come out together through the pores of the glass, and so go to the prime conductor, for the electric fluid itself cannot come

through, and the prime conductor is always supplied from the cushion, and that from the floor. And besides, when the globe is filled with cinnamon, or other non-electric, no electric fluid can be obtained from its outer surface, for the reason before mentioned. I have tried another way, which I thought more likely to obtain a mixture of the electric and other effluvia together, if such a mixture had been possible. I placed a glass plate under my cushion, to cut off the communication between the cushion and the floor, then brought a small chain from the cushion into a glass of oil of turpentine, and carried another chain from the oil of turpentine to the floor, taking care that the chain from the cushion to the glass should touch no part of the frame of the machine. Another chain was fixed to the prime conductor, and held in the hand of a person to be electrified. The ends of the two chains in the glass were near an inch distant from each other, the oil of turpentine between. Now the globe being turned could draw no fire from the floor through the machine, the communication that way being cut off by the thick glass plate under the cushion; it must then draw it through the chains whose ends were dipped in the oil of turpentine. And as the oil of turpentine, being an electric *per se*, would not conduct, what came up from the floor was obliged to jump from the end of one chain to the end of the other, through the substance of that oil, which we could see in large sparks, and so it had a fair opportunity of seizing some of the finest particles of the oil in its passage, and carrying them off with it;

but no such effect followed, nor could I perceive the least difference in the smell of the electric effluvia thus collected, from what it has when collected otherwise, nor does it otherwise affect the body of a person electrized. I likewise put into a phial, instead of water, a strong purgative liquid, and then charged the phial, and took repeated shocks from it, in which case every particle of the electrical fluid must, before it went through my body, have first gone through the liquid when the phial is charging, and returned through it when discharging, yet no other effect followed than if it had been charged with water. I have also smelled the electric fire when drawn through gold, silver, copper, lead, iron, wood, and the human body, and could perceive no difference; the odor is always the same, where the spark does not burn what it strikes; and therefore I imagine it does not take that smell from any quality of the bodies it passes through. And indeed, as that smell so readily leaves the electric matter, and adheres to the knuckle receiving the sparks, and to other things, I suspect that it never was connected with it, but arises instantaneously from something in the air acted upon by it. For if it was fine enough to come with the electric fluid through the body of one person, why should it stop on the skin of another?

But I shall never have done, if I tell you all my conjectures, thoughts, and imaginations on the nature and operations of this electric fluid, and relate the variety of little experiments we have tried. I have already made this paper too long, for which I must

crave pardon, not having now time to abridge it. I shall only add that, as it has been observed here that spirits will fire by the electric spark in the summer-time without heating them, when Fahrenheit's thermometer is above seventy; so, when colder, if the operator puts a small flat bottle of spirits in his bosom, or a close pocket, with the spoon, some little time before he uses them, the heat of his body will communicate warmth more than sufficient for the purpose.

ADDITIONAL EXPERIMENTS;

Proving that the Leyden Bottle has no more Electrical Fire in it when charged than before, nor less when discharged; that, in discharging, the Fire does not issue from the Wire and the Coating at the same Time, as some have thought, but that the Coating always receives what is discharged by the Wire, or an equal Quantity; the outer Surface being always in a Negative State of Electricity, when the inner Surface is in a Positive State.

Place a thick plate of glass under the rubbing cushion, to cut off the communication of electrical fire from the floor to the cushion; then, if there be no fine points or hairy threads sticking out from the cushion, or from the parts of the machine opposite to the cushion (of which you must be careful), you can get but a few sparks from the prime conductor, which are all the cushion will part with.

Hang a phial then on the prime conductor, and it

will not charge, though you hold it by the coating. But—

Form a communication by a chain from the coating to the cushion, and the phial will charge.

For the globe then draws the electric fire out of the outside surface of the phial, and forces it through the prime conductor and wire of the phial into the inside surface.

Thus the bottle is charged with its own fire, no other being to be had while the glass plate is under the cushion.

Hang two cork balls by flaxen threads to the prime conductor ; then touch the coating of the bottle, and they will be electrified and recede from each other.

For, just as much fire as you give the coating, so much is discharged through the wire upon the prime conductor, whence the cork balls receive an electrical atmosphere. But—

Take a wire bent in the form of a C, with a stick of wax fixed to the outside of the curve to hold it by ; and apply one end of this wire to the coating, and the other at the same time to the prime conductor, the phial will be discharged ; and if the balls are not electrified before the discharge, neither will they appear to be so after the discharge, for they will not repel each other.

If the phial really exploded at both ends, and discharged fire from both coating and wire, the balls would be *more* electrified, and recede *farther* ; for none of the fire can escape, the wax handle preventing.

But if the fire with which the inside surface is surcharged be so much precisely as is wanted by the outside surface, it will pass round through the wire fixed to the wax handle, restore the equilibrium in the glass, and make no alteration in the state of the prime conductor.

Accordingly we find that if the prime conductor be electrified, and the cork balls in a state of repellency before the bottle is discharged, they continue so afterwards. If not, they are not electrified by that discharge.

LXXIII.

TO SAMUEL JOHNSON.¹

PHILADELPHIA, 23 August, 1750.

DEAR SIR:—We received your favor of the 16th instant. Mr. Peters will hardly have time to write to you by this post, and I must be short. Mr. Francis spent the last evening with me, and we were all glad to hear that you seriously meditate a visit after the middle of next month, and that you will inform us by a line when to expect you. We drank your health and Mrs. Johnson's, remembering your kind entertainment of us at Stratford.

I think with you, that nothing is of more importance for the public weal, than to form and train up youth in wisdom and virtue. Wise and good men are, in my opinion, the strength of a state; much

¹ Dr. Samuel Johnson was the first president of King's (now Columbia) College, New York. This letter appears to have been written at the time

of the first establishment of the College of Philadelphia, the presidency of which institution had been offered to him, but was declined.

more so than riches or arms, which, under the management of ignorance and wickedness, often draw on destruction, instead of providing for the safety of the people. And though the culture bestowed on *many* should be successful only with a *few*, yet the influence of those few and the service in their power may be very great. Even a single woman, that was wise, by her wisdom saved the city.

I think also that general virtue is more probably to be expected and obtained from the education of youth, than from the exhortation of adult persons ; bad habits and vices of the mind being, like diseases of the body, more easily prevented than cured. I think, moreover, that talents for the education of youth are the gift of God ; and that he on whom they are bestowed, whenever a way is opened for the use of them, is as strongly *called* as if he heard a voice from heaven ; nothing more surely pointing out duty in a public service, than ability and opportunity of performing it.

I have not yet discoursed with Dr. Jenney concerning your removal hither. You have reason, I own, to doubt whether your coming on the foot I proposed would not be disagreeable to him, though I think it ought not ; for, should his particular interest be somewhat affected by it, that ought not to stand in competition with the *general good* ; especially as it cannot be much affected, he being old, and rich, and without children. I will, however, learn his sentiments before the next post. But whatever influence they might have on your determination about remov-

ing, they need have none on your intention of visiting; and if you favor us with the visit, it is not necessary that you should previously write to him to learn his disposition about your removal, since you will see him, and when we are all together those things may be better settled in conversation than by letters at a distance.

Your tenderness of the Church's peace is truly laudable; but methinks to build a new church in a growing place is not properly *dividing* but *multiplying*; and will really be the means of increasing the number of those who worship God in that way. Many who cannot now be accommodated in the church go to other places or stay at home; and if we had another church, many who go to other places or stay at home would go to church. I suppose the interest of the church has been far from suffering in Boston by the building of two churches there in my memory. I had for several years nailed against the wall of my house a pigeon-box that would hold six pair; and though they bred as fast as my neighbours' pigeons, I never had more than six pair, the old and strong driving out the young and weak, and obliging them to seek new habitations. At length I put up an additional box with apartments for entertaining twelve pair more, and it was soon filled with inhabitants by the overflowing of my first box and of others in the neighbourhood. This I take to be a parallel case with the building a new church here.

Your years I think are not so many as to be an objection of any weight, especially considering the vigor of your constitution. For the smallpox, if it should

spread here, you might inoculate with great probability and safety ; and I think that distemper generally more favorable here than farther northward. Your objection about the politeness of Philadelphia and your imagined rusticity is mere compliment, and your diffidence of yourself absolutely groundless.

My humble respects, if you please, to your brethren at the Commencement. I hope they will advise you to what is most for the good of the whole, and then I think they will advise you to remove hither. Please to tender my best respects and service to Mrs. Johnson and your son. I am, dear Sir, your obliged and affectionate humble servant, B. FRANKLIN.

LXXIV.

TO JAMES BOWDOIN,¹ AT BOSTON.

PHILADELPHIA, 25 October, 1750.

SIR :—Enclosed with this I send you all my electrical papers, fairly transcribed, and I have, as you desired, examined the copy, and find it correct. I shall be glad to have your observations on them, and if in any part I have not made myself well understood, I will on notice endeavour to explain the obscure passages by letter. My compliments to Mr. Cooper and the other gentlemen who were with you here. I hope you all got safe home. I am, Sir,

Your most humble servant,

B. FRANKLIN.

¹ Mr. Bowdoin was at this time twenty-three years old. He became distinguished afterwards as a philosopher and statesman, being one of the principal founders and the first president of the American Academy

of Arts and Sciences. He took an active and prominent part in the events of the American Revolution, and was subsequently governor of Massachusetts.—SPARKS.

LXXV.

TO JARED ELIOT.

PHILADELPHIA, 25 October, 1750.

DEAR SIR :—I ought to have informed you sooner, that we got well home, and should have inquired after your health, as we left you in the hands of a fever. I beg you will excuse the delay, and desire you will remember in my favor the old saying, *They who have much business must have much pardon*. Whenever Mr. Francis and I meet of an evening, we drink your health, among our other New England friends, and he desires to be always respectfully remembered to you.

I am glad to hear you are got well again ; but I cannot have the pleasure of seeing you again this year. I will write to Colonel Schuyler, and obtain for you a particular account of his manner of improving his banked grounds ; and will also procure for you a specimen of our alum earth, with Mr. Syng's observations on it. In return (for you know there is no trade without returns) I request you to procure for me a particular account of the manner of making a new kind of fence we saw at Southhold, on Long Island, which consists of a bank and hedge. I would know every particular relating to the matter, as the best thickness, height and slope of the bank ; the manner of erecting it, the best time for the work, the best way of planting the hedge, the price of the work to laborers per rod or perch, and whatever may be of use for our information here, who begin in many places to be at a loss for wood to make fence with.

We were told at Southhold, that this kind of fencing had been long practised with success at Southampton and other places, on the south side of the Island, but was new among them. I hear the minister at Southhold is esteemed an ingenious man; perhaps you may know him, and he will at your request favor me with an explicit account of these fences.

The fore part of the summer here was extremely dry, and the grass in many places was burnt up. But we had a good crop of wheat; and, rains coming on about the end of July, we had in August a new spring, the grass sprouting again wonderfully thick and fast, in fields where we thought the very roots had been destroyed. Our grave-diggers said they found the earth hot sensibly at three feet depth, even after these rains; perhaps the great heat below and the moisture above occasioned this sudden and profuse vegetation, the whole country being, as it were, one great hot-bed.

I am, with esteem and affection, dear Sir,

Your obliged humble servant,

B. FRANKLIN.

LXXVI.

TO A FRIEND IN BOSTON.²

PHILADELPHIA, 25 December, 1750.

I have lately made an experiment in electricity that I desire never to repeat. Two nights ago, being

¹ A copy of this letter was found among Governor Bowdoin's papers, without the name of the person to whom it was addressed.—SPARKS.

about to kill a turkey by the shock from two large glass jars, containing as much electrical fire as forty common phials, I inadvertently took the whole through my own arms and body, by receiving the fire from the united top wires with one hand, while the other held a chain connected with the outsides of both jars. The company present (whose talking to me and to one another, I suppose, occasioned my inattention to what I was about) say that the flash was very great, and the crack as loud as a pistol; yet, my senses being instantly gone, I neither saw the one nor heard the other; nor did I feel the stroke on my hand, though I afterwards found it raised a round swelling where the fire entered, as big as half a pistol-bullet, by which you may judge of the quickness of the electrical fire, which by this instance seems to be greater than that of sound, light, or animal sensation.

What I can remember of the matter is that I was about to try whether the bottles or jars were fully charged by the strength and length of the stream issuing to my hand, as I commonly used to do, and which I might safely enough have done if I had not held the chain in the other hand. I then felt what I know not how well to describe—a universal blow throughout my whole body from head to foot, which seemed within as well as without; after which the first thing I took notice of was a violent, quick shaking of my body, which gradually remitting, my sense as gradually returned, and then I thought the bottles must be discharged, but could not conceive

how, till at last I perceived the chain in my hand, and recollected what I had been about to do. That part of my hand and fingers which held the chain was left white, as though the blood had been driven out, and remained so eight or ten minutes after, feeling like dead flesh; and I had a numbness in my arms and the back of my neck, which continued till the next morning, but wore off. Nothing remains now of this shock but a soreness in my breast-bone, which feels as if it had been bruised. I did not fall, but suppose I should have been knocked down if I had received the stroke in my head. The whole was over in less than a minute.

You may communicate this to Mr. Bowdoin as a caution to him, but do not make it more public, for I am ashamed to have been guilty of so notorious a blunder; a match for that of the Irishman whom my sister told me of, who, to divert his wife, poured the bottle of gunpowder on the live coal; or of that other, who, being about to steal powder, made a hole in the cask with a hot iron. I am yours, &c.,

B. FRANKLIN.

P. S.—The jars hold six gallons each.

LXXVII.

TO CADWALLADER COLDEN, AT NEW YORK.

PHILADELPHIA, —, 1751.

SIR:—I enclose you answers, such as my present hurry of business will permit me to make, to the

principal queries contained in yours of the 28th instant, and beg leave to refer you to the latter piece in the printed collection of my papers, for further explanation of the difference between what are called *electrics per se* and *non-electrics*. When you have time to read and consider these papers, I will endeavour to make any new experiments you shall propose, that you think may afford farther light or satisfaction to either of us; and shall be much obliged to you for such remarks, objections, &c., as may occur to you.

I forget whether I wrote to you that I have melted brass pins and steel needles, inverted the poles of the magnetic needle, given a magnetism and polarity to needles that had none, and fired dry gunpowder by the electric spark. I have five bottles that contain eight or nine gallons each, two of which charged are sufficient for those purposes; but I can charge and discharge them altogether. There are no bounds (but what expense and labor give) to the force man may raise and use in the electrical way; for bottle may be added to bottle *ad infinitum*, and all united and discharged together as one, the force and effect proportioned to their number and size. The greatest known effects of common lightning may, I think, without much difficulty, be exceeded in this way, which a few years since could not have been believed, and even now may seem to many a little extravagant to suppose. So we are got beyond the skill of Rabelais's devils of two years old, who, he humorously says, had only learned

to thunder and lighten a little round the head of a cabbage.

I am, with sincere respect,

Your most obliged humble servant,

B. FRANKLIN.

Queries and Answers Referred to in the Foregoing Letter.

Query. Wherein consists the difference between an *electric* and a *non-electric* body?

Answer. The terms *electric per se* and *non-electric* were first used to distinguish bodies, on a mistaken supposition that those called *electrics per se* alone contained electric matter in their substance which was capable of being excited by friction, and of being produced or drawn from them, and communicated to those called *non-electrics*, supposed to be destitute of it; for the glass, &c., being rubbed, discovered signs of having it, by snapping to the finger, attracting, repelling, &c., and could communicate those signs to metals and water. Afterwards it was found that rubbing of glass would not produce the electric matter, unless a communication was preserved between the rubber and the floor; and subsequent experiments proved that the electric matter was really drawn from those bodies that at first were thought to have none in them. Then it was doubted whether glass, and other bodies called *electrics per se*, had really any electric matter in them, since they apparently afforded none but what they first extracted from those which had been called *non-electrics*. But

some of my experiments show that glass contains it in great quantity, and I now suspect it to be pretty equally diffused in all the matter of this terraqueous globe. If so, the terms *electric per se* and *non-electric* should be laid aside as improper ; and (the only difference being this, that some bodies will conduct electric matter, and others will not) the terms *conductor* and *non-conductor* may supply their place. If any portion of electric matter is applied to a piece of conducting matter, it penetrates and flows through it, or spreads equally on its surface ; if applied to a piece of non-conducting matter, it will do neither. Perfect conductors of electric matter are only metals and water ; other bodies conducting only as they contain a mixture of those, without more or less of which they will not conduct at all.¹ This (by the way) shows a new relation between metals and water heretofore unknown.

To illustrate this by a comparison, which, however, can only give a faint resemblance. Electric matter passes through conductors as water passes through a porous stone, or spreads on their surfaces as water spreads on a wet stone ; but when applied to non-conductors, it is like water dropped on a greasy stone, it neither penetrates, passes through, nor spreads on the surface, but remains in drops where it falls. See farther on this head, in my last printed piece, entitled *Opinions and Conjectures, &c.* 1749.

Query. What are the effects of air in electrical experiments ?

Answer. All I have hitherto observed are these.

¹ This proposition is since found to be too general, Mr. Wilson having discovered that melted wax and rosin will also conduct,

Moist air receives and conducts the electrical matter in proportion to its moisture, quite dry air not at all ; air is therefore to be classed with the non-conductors. Dry air assists in confining the electrical atmosphere to the body it surrounds, and prevents its dissipating ; for *in vacuo* it quits easily, and points operate stronger—that is, they throw off or attract the electrical matter more freely and at greater distances ; so that air intervening obstructs its passage from body to body in some degree. A clean electrical phial and wire, containing air instead of water, will not be charged, nor give a shock, any more than if it was filled with powder of glass ; but exhausted of air, it operates as well as if filled with water. Yet an electric atmosphere and air do not seem to exclude each other, for we breathe freely in such an atmosphere, and dry air will blow through it without displacing or driving it away. I question whether the strongest dry north-wester would dissipate it. I once electrified a large cork ball at the end of a silk thread three feet long, the other end of which I held in my fingers, and whirled it round, like a sling, one hundred times in the air, with the swiftest motion I could possibly give it ; yet it retained its electric atmosphere, though it must have passed through eight hundred yards of air, allowing my arm in giving the motion to add a foot to the semidiameter of the circle. By quite dry air, I mean the driest we have ; for perhaps we never have any perfectly free from moisture. An electrical atmosphere raised round a thick wire, inserted in a phial of air, drives out none of the air, nor on withdrawing that atmosphere will any air rush

in, as I have found by a curious experiment¹ accurately made, whence we concluded that the air's elasticity was not affected thereby.

An Experiment towards Discovering More of the Qualities of the Electric Fluid.

From the prime conductor, hang a bullet by a wire hook ; under the bullet, at half an inch distance, place a bright piece of silver to receive the sparks ; then let the wheel be turned, and in a few minutes (if the repeated sparks continually strike in the same spot) the silver will receive a blue stain, nearly the color of a watch-spring.

A bright piece of iron will also be spotted, but not with that color ; it rather seems corroded.

On gold, brass, or tin I have not perceived it makes any impression. But the spots on the silver or iron will be the same, whether the bullet be lead, brass, gold, or silver.

On a silver bullet there will also appear a small spot, as well as on the plate below it.

¹ The experiment here mentioned was thus made. An empty phial was stopped with a cork. Through the cork passed a thick wire, as usual in the Leyden experiment, which wire almost reached the bottom. Through another part of the cork passed one leg of a small glass siphon ; the other leg on the outside came down almost to the bottom of the phial. This phial was held a short time in the hand, which, warming and of course rarefying the air within, drove a small part of it out through the siphon. Then a little red ink in a tea-spoon was applied to the opening of the outer leg of the siphon ; so that as the air within cooled, a little of the ink

might rise in that leg. When the air within the bottle came to be of the same temperature of that without, the drop of red ink would rest in a certain part of the leg. But the warmth of a finger applied to the phial would cause that drop to descend, as the least outward coolness applied would make it ascend. When it had found its situation, and was at rest, the wire was electrified by a communication from the prime conductor. This was supposed to give an electric atmosphere to the wire within the bottle, which might likewise rarefy the included air, and of course depress the drop of ink in the siphon. But no such effect followed.—F.

LXXVIII.

IMPORTANCE OF GAINING AND PRESERVING THE FRIENDSHIP OF THE INDIANS.¹

[*The author of the foregoing essay, having desired the printer to communicate the manuscript to some of the most judicious of his friends, it produced the following letter from one of them, the publishing whereof, we think, needs no other apology, viz.:*]

PHILADELPHIA, March 20, 1751.

DEAR MR. PARKER :

I have, as you desire, read the manuscript you sent me, and am of opinion, with the publick-spirited author, that securing the friendship of the *Indians* is of the greatest consequence to these colonies; and that the surest means of doing it are, to regulate the *Indian* trade, so as to convince them, by experience, that they may have the best and cheapest goods and the fairest dealings from the *English*; and to unite the several governments, so as to form a strength that the *Indians* may depend on for protection in case of a rupture with the *French*; or apprehend great danger from, if they should break with, us.

¹The prospect of a rupture between the English and French governments in 1750-51 were so threatening that the friendship of the Indian tribes became a matter of supreme importance, and how to secure it occupied the attention of leading men throughout the colonies. In the appendix to the second edition of a pamphlet entitled "The Importance of Gaining and Preserving the Friendship of the Indians to British Interests Considered," London, 1782, is a letter which bears so many distinctive traces of Franklin's authorship that it has

seemed to merit a place in this collection.

The editor is happy to acknowledge his obligations to Professor Edward Eggleston for calling his attention to this letter, which that gentleman found in the Harvard College Library. "I think," says Professor Eggleston, in a note to the editor, "the pamphlet is anonymous, but I have a minute that the author is Archibald Kennedy. The first edition, N. Y., 1751, and the letter I believe to be Franklin's was dated at Philadelphia and addressed to the printer of the first edition—Parker."

This union of the colonies, however necessary, I apprehend is not to be brought about by the means that have hitherto been used for that purpose. A governor of one colony, who happens from some circumstances in his own government to see the necessity of such an union, writes his sentiments of the matter to the other governors, and desires them to recommend it to their respective assemblies. They accordingly lay the letters before those assemblies, and perhaps recommend the proposal in general words. But governors are often on ill terms with their assemblies, and seldom are the men that have the most influence among them. And perhaps some governors, though they openly recommend the scheme, may privately throw cold water on it, as thinking additional publick charges will make their people less able or less willing to give to them. Or perhaps they do not clearly see the necessity of it, and therefore do not very earnestly press the consideration of it; and no one being present that has the affair at heart to back it, to answer and remove objections, &c., it is easily dropp'd, and nothing is done. Such an union is certainly necessary to us all, but more immediately so to our government. Now if you were to pick out half a dozen men of good understanding and address, and furnish them with a reasonable scheme and proper instructions, and send them in the nature of ambassadors to the other colonies, where they might apply particularly to all the leading men, and by proper management get them to engage in promoting the scheme; where, by

being present, they would have the opportunity of pressing the affair both in publick and private, obviating difficulties as they arise, answering objections as soon as they are made, before they spread and gather strength in the minds of the people, &c., &c., I imagine such an union might thereby be made and established ; for reasonable, sensible men, can always make a reasonable scheme appear such to other reasonable men, if they take pains, and have time and opportunity for it ; unless from some circumstances their honesty and good intentions are suspected. A voluntary union entered into by the colonies themselves, I think, would be preferable to one imposed by parliament ; for it would be perhaps not much more difficult to procure, and more easy to alter and improve, as circumstances should require and experience direct. It would be a very strange thing, if *Six Nations* of ignorant savages should be capable of forming a scheme for such an union, and be able to execute it in such a manner, as that it has subsisted ages, and appears indissoluble ; and yet that a like union should be impracticable for ten or a dozen *English* colonies, to whom it is more necessary and must be more advantageous, and who cannot be supposed to want an equal understanding of their interests.

Were there a general council form'd by all the colonies, and a general governor appointed by the crown to preside in that council, or in some manner to concur with and confirm their acts, and take care of the execution, every thing relating to Indian affairs

and the defence of the colonies might be properly put under their management. Each colony should be represented by as many members as it pays sums of hundred pounds in the common treasury for the common expence ; which treasury would perhaps be best and most equitably supply'd by an equal excise on strong liquors in all the colonies, the produce never to be apply'd to the private use of any colony, but to the general service. Perhaps if the council were to meet successively at the capitals of the several colonies, they might thereby become better acquainted with the circumstances, interests, strength, or weakness, &c., of all, and thence be able to judge better of measures proposed from time to time : at least it might be more satisfactory to the colonies if this were proposed as a part of the scheme, for a preference might create jealousy and dislike.

I believe the place mentioned is a very suitable one to build a fort on. In times of peace, parties of the garrisons of all frontier forts might be allowed to go out on hunting expeditions, with or without Indians, and have the profit to themselves of the skins they got ; by this means a number of wood-runners would be formed, well acquainted with the country, and of great use in the war time as guides of parties and scouts, &c. Every Indian is a hunter ; and as their manner of making war, *viz.*, by skulking, surprising, and killing particular persons and families, is just the same as their hunting, only changing the object, every Indian is a disciplined soldier. Soldiers of this kind

are always wanted in the colonies in an Indian war, for the European military discipline is of little use in these woods.

Publick trading houses would certainly have a good effect towards regulating the private trade, and preventing the impositions of the private traders, and therefore such should be established in suitable places all along the frontiers ; and the superintendent of the trade, proposed by the author, would, I think, be a useful officer.

The observation concerning the importation of Germans in too great numbers into Pennsylvania is, I believe, a very just one. This will in a few years become a German colony ; instead of their learning our language, we must learn theirs, or live as in a foreign country. Already the English begin to quit particular neighborhoods surrounded by Dutch, being made uneasy by the disagreeableness of disonant manners ; and, in time, numbers will probably quit the province for the same reason. Besides, the Dutch under-live, and are thereby enabled to under-work and under-sell the English, who are thereby extremely incommoded, and consequently disgusted, so that there can be no cordial affection or unity between the two nations. How good subjects they may make, and how faithful to the British interest, is a question worth considering. And, in my opinion, equal numbers might have been spared from the British islands without being missed there, and on proper encouragement would have come over. I say without being missed, perhaps I might say without lessening the

number of people at home. I question, indeed, whether there be a man the less in Britain for the establishment of the colonies. An island can support but a certain number of people ; when all employments are full, multitudes refrain from marriage, till they can see how to maintain a family. The number of Englishmen in England cannot by their present common increase be doubled in a thousand years ; but if half of them were taken away and planted in America, where there is room for them to increase, and sufficient employment and subsistence, the number of Englishmen would be doubled in a hundred years ; for those left at home would multiply in that time so as to fill up the vacancy, and those here would at least keep pace with them.

Every one must approve the proposal of encouraging a number of sober discreet smiths to reside among the Indians. They would doubtless be of great service. The whole subsistence of Indians depends on keeping their guns in order, and if they are obliged to make a journey of two or three hundred miles to an English settlement to get a lock mended, it may, besides the trouble, occasion the loss of their hunting season. They are people that think much of their temporal, but little of their spiritual, interests ; and therefore, as he would be a most useful and necessary man to them, a smith is more likely to influence them than a Jesuit ; provided he has a good common understanding, and is from time to time well instructed.

I wish I could offer any thing for the improvement of the author's piece, but I have little knowledge

and less experience in these matters. I think it ought to be printed ; and should be glad to see there were a more general communication of the sentiments of judicious men, on subjects so generally interesting ; it would certainly produce good effects. Please to present my respects to the gentleman, and thank him for the perusal of the manuscript.

I am, yours affectionately.

LXXIX.

OBSERVATIONS

CONCERNING

THE INCREASE OF MANKIND AND THE PEOPLING OF COUNTRIES.

1. Tables of the proportion of marriages to births, of deaths to births, of marriages to the number of inhabitants, &c., formed on observations made upon the bills of mortality, christenings, &c. of populous cities, will not suit countries ; nor will tables formed on observations made on full-settled old countries as Europe, suit new countries as America.¹

2. For people increase in proportion to the number of marriages, and that is greater in proportion to the ease and convenience of supporting a family. When families can be easily supported, more persons marry, and earlier in life.

¹ Nor will tables which are accurately calculated at one period, necessarily continue to be correct in the same country at another period. The

chances of life have been ascertained to be greater in Europe during the last half century than they were formerly.—W. PHILLIPS.

3. In cities, where all trades, occupations, and offices are full, many delay marrying till they can see how to bear the charges of a family ; which charges are greater in cities, as luxury is more common ; many live single during life and continue servants to families, journeymen to trades, &c.; hence cities do not, by natural generation, supply themselves with inhabitants ; the deaths are more than the births.

4. In countries full settled the case must be nearly the same ; all lands being occupied and improved to the height, those who cannot get land must labor for others that have it ; when laborers are plenty their wages will be low ; by low wages a family is supported with difficulty ; this difficulty deters many from marriage, who therefore long continue servants and single. Only as the cities take supplies of people from the country, and thereby make a little more room in the country, marriage is a little more encouraged there, and the births exceed the deaths.

5. Europe is generally full settled with husbandmen, manufacturers, &c., and therefore cannot now much increase in people. America is chiefly occupied by Indians, who subsist mostly by hunting. The hunter, of all men, requires the greatest quantity of land from whence to draw his subsistence (the husbandman subsisting on much less, the gardener on still less, and the manufacturer requiring least of all). The Europeans found America as fully settled as it well could be by hunters ; yet these, having large tracts, were easily prevailed on to part with portions of territory to the new comers, who did not much interfere

with the natives in hunting, and furnished them with many things they wanted.

6. Land being thus plenty in America, and so cheap as that a laboring man that understands husbandry can in a short time save money enough to purchase a piece of new land sufficient for a plantation, whereon he may subsist a family, such are not afraid to marry; for, if they even look far enough forward to consider how their children, when grown up, are to be provided for, they see that more land is to be had at rates equally easy, all circumstances considered.

7. Hence, marriages in America are more general, and more generally early than in Europe. And if it is reckoned there that there is but one marriage per annum among one hundred persons, perhaps we may here reckon two; and if in Europe they have but four births to a marriage (many of their marriages being late), we may here reckon eight, of which, if one half grow up, and our marriages are made, reckoning one with another, at twenty years of age, our people must at least be doubled every twenty years.

8. But, notwithstanding this increase, so vast is the territory of North America, that it will require many ages to settle it fully, and, till it is fully settled, labor will never be cheap here, where no man continues long a laborer for others, but gets a plantation of his own; no man continues long a journeyman to a trade, but goes among those new settlers and sets up for himself, &c. Hence labor is no cheaper now

in Pennsylvania than it was thirty years ago, though so many thousand laboring people have been imported.

9. The danger, therefore, of these colonies interfering with their mother country in trades that depend on labor, manufactures, &c., is too remote to require the attention of Great Britain.

10. But in proportion to the increase of the colonies, a vast demand is growing for British manufactures, a glorious market wholly in the power of Britain, in which foreigners cannot interfere, which will increase in a short time even beyond her power of supplying, though her whole trade should be to her colonies; therefore, Britain should not too much restrain manufactures in her colonies. A wise and good mother will not do it. To distress is to weaken, and weakening the children weakens the whole family.

11. Besides, if the manufactures of Britain (by reason of the American demands) should rise too high in price, foreigners who can sell cheaper will drive her merchants out of foreign markets; foreign manufactures will thereby be encouraged and increased, and consequently foreign nations, perhaps her rivals in power, grow more populous and more powerful; while her own colonies, kept too low, are unable to assist her, or add to her strength.

12. It is an ill-grounded opinion that, by the labor of slaves, America may possibly vie in cheapness of manufactures with Britain. The labor of slaves can never be so cheap here as the labor of workingmen is

in Britain. Any one may compute it. Interest of money is in the colonies from six to ten per cent. Slaves, one with another, cost thirty pounds sterling per head. Reckon then the interest of the first purchase of a slave, the insurance or risk on his life, his clothing and diet, expenses in his sickness and loss of time, loss by his neglect of business (neglect is natural to the man who is not to be benefited by his own care or diligence), expense of a driver to keep him at work, and his pilfering from time to time, almost every slave being by nature a thief, and compare the whole amount with the wages of a manufacturer of iron or wool in England, you will see that labor is much cheaper there than it ever can be by negroes here. Why, then, will Americans purchase slaves? Because slaves may be kept as long as a man pleases, or has occasion for their labor; while hired men are continually leaving their masters (often in the midst of his business) and setting up for themselves (sec. 8).

13. As the increase of people depends on the encouragement of marriages, the following things must diminish a nation, viz.: 1. *The being conquered*; for the conquerors will engross as many offices and exact as much tribute or profit on the labor of the conquered as will maintain them in their new establishment; and this, diminishing the subsistence of the natives, discourages their marriages, and so gradually diminishes them, while the foreigners increase. 2. *Loss of territory*. Thus, the Britons being driven into Wales, and crowded together in a barren country, insufficient to support such great numbers, dimin-

ished till the people bore a proportion to the produce, while the Saxons increased on their abandoned lands till the island became full of English. And were the English now driven into Wales by some foreign nation, there would in a few years be no more Englishmen in Britain than there are now people in Wales.

3. *Loss of trade.* Manufactures exported, draw subsistence from foreign countries for numbers, who are thereby enabled to marry and raise families. If the nation be deprived of any branch of trade, and no new employment is found for the people occupied in that branch, it will also be soon deprived of so many people. 4. *Loss of food.* Suppose a nation has a fishery, which not only employs great numbers, but makes the food and subsistence of the people cheaper. If another nation becomes master of the seas, and prevents the fishery, the people will diminish in proportion as the loss of employ and dearness of provision make it more difficult to subsist a family. 5. *Bad government and insecurity of property.* People not only leave such a country, and, settling abroad, incorporate with other nations, lose their native language, and become foreigners, but the industry of those that remain being discouraged, the quantity of subsistence in the country is lessened, and the support of a family becomes more difficult. So heavy taxes tend to diminish a people. 6. *The introduction of slaves.* The negroes brought into the English sugar islands have greatly diminished the whites there; the poor are by this means deprived of employment, while a few families acquire vast estates, which they spend on

foreign luxuries, and in educating their children in the habit of those luxuries. The same income is needed for the support of one that might have maintained one hundred. The whites who have slaves, not laboring are enfeebled, and therefore not so generally prolific; the slaves being worked too hard and ill fed, their constitutions are broken, and the deaths among them are more than the births; so that a continual supply is needed from Africa. The northern colonies, having few slaves, increase in whites. Slaves also pejorate the families that use them; the white children become proud, disgusted with labor, and being educated in idleness, are rendered unfit to get a living by industry.

14. Hence, the prince that acquires new territory, if he finds it vacant, or removes the natives to give his own people room; the legislator that makes effectual laws for promoting of trade, increasing employment, improving of land by more or better tillage, providing more food by fisheries, securing property, &c.; and the man that invents new trades, arts, or manufactures, or new improvements in husbandry, may be properly called fathers of their nation, as they are the cause of the generation of multitudes by the encouragement they afford to marriage.

15. As to privileges granted to the married (such as the *jus trium liberorum* among the Romans), they may hasten the filling of a country that has been thinned by war or pestilence, or that has otherwise vacant territory, but cannot increase a people beyond the means provided for their subsistence.

16. Foreign luxuries and needless manufactures, imported and used in a nation, do, by the same reasoning, increase the people of the nation that furnishes them, and diminish the people of the nation that uses them. Laws, therefore, that prevent such importations, and on the contrary promote the exportation of manufactures to be consumed in foreign countries, may be called (with respect to the people that make them) *generative laws*, as, by increasing subsistence, they encourage marriage. Such laws likewise strengthen a country doubly, by increasing its own people and diminishing its neighbours.

17. Some European nations prudently refuse to consume the manufactures of East India; they should likewise forbid them to their colonies; for the gain to the merchant is not to be compared with the loss, by this means, of people to the nation.

18. Home luxury in the great increases the nation's manufacturers employed by it, who are many, and only tends to diminish the families that indulge in it, who are few. The greater the common fashionable expense of any rank of people, the more cautious they are of marriage. Therefore luxury should never be suffered to become common.

19. The great increase of offspring in particular families is not always owing to greater fecundity of nature, but sometimes to examples of industry in the heads, and industrious education; by which the children are enabled to provide better for themselves, and their marrying early is encouraged from the prospect of good subsistence,

20. If there be a sect therefore in our nation that regard frugality and industry as religious duties, and educate their children therein, more than others commonly do, such sect must consequently increase more by natural generation than any other sect in Britain.

21. The importation of foreigners into a country that has as many inhabitants as the present employments and provisions for subsistence will bear, will be in the end no increase of people, unless the new comers have more industry and frugality than the natives, and then they will provide more subsistence, and increase in the country ; but they will gradually eat the natives out. Nor is it necessary to bring in foreigners to fill up any occasional vacancy in a country, for such vacancy (if the laws are good, sec. 14, 16) will soon be filled by natural generation. Who can now find the vacancy made in Sweden, France, or other warlike nations, by a plague of heroism forty years ago ; in France, by the expulsion of the Protestants ; in England, by the settlement of her colonies ; or in Guinea, by one hundred years' exportation of slaves, that has blackened half America ? The thinness of inhabitants in Spain is owing to national pride and idleness, and other causes, rather than to the expulsion of the Moors, or to the making of new settlements.

22. There is, in short, no bound to the prolific nature of plants or animals, but what is made by their crowding and interfering with each other's means of subsistence. Were the face of the earth vacant of

other plants, it might be gradually sowed and over-spread with one kind only, as, for instance, with fennel; and were it empty of other inhabitants, it might in a few ages be replenished from one nation only, as, for instance, with Englishmen. Thus, there are supposed to be now upwards of one million English souls in North America (though it is thought scarce eighty thousand has been brought over sea), and yet perhaps there is not one the fewer in Britain, but rather many more, on account of the employment the colonies afford to manufacturers at home. This million doubling, suppose but once in twenty-five years, will in another century be more than the people of England, and the greatest number of Englishmen will be on this side the water.¹ What an accession of power to the British empire by sea as well as land! What increase of trade and navigation! What numbers of ships and seamen! We have been here but little more than one hundred years, and yet the force of our privateers in the late war, united, was greater, both in men and guns, than that of the whole British navy in Queen Elizabeth's time. How important an

¹ It is a curious fact that to this tract the world is largely, if not entirely, indebted for a book which, in its day, produced a remarkable sensation, and the theories of which are still occasionally debated. Malthus' "Essay on Population" would probably never have been written but for the support of his theory which he was able to extract from the 22d clause of this paper. In that clause Franklin, with his habitual caution, referring to the number of "English souls" then in North America says: "This million doubling, suppose but once in twenty-five

years, will in another century be more than the people of England." Malthus accepts this rather hypothetical statement as evidence of a demonstrated fact, and proceeds to build upon it his chimerical theory that the population of the earth increases in a geometrical ratio, while the means for its subsistence increases only in an arithmetical ratio. William Godwin wrote a reply to Malthus entitled "An Enquiry concerning the Power of Increase in the Numbers of Mankind, being an Answer to Mr. Malthus' Essay on that Subject," which was published in 1820,

affair then to Britain is the present treaty for settling the bounds between her colonies and the French, and how careful should she be to secure room enough, since on the room depends so much the increase of her people.

23. In fine, a nation well regulated is like a polypus. Take away a limb, its place is soon supplied ; cut it in two, and each deficient part shall speedily grow out of the part remaining. Thus, if you have room and substance enough, as you may by dividing make ten polypuses out of one, you may of one make ten nations, equally populous and powerful, or rather increase a nation ten fold in numbers and strength.

And since detachments of English from Britain, sent to America, will have their places at home so soon supplied and increase so largely here, why should the Palatine boors be suffered to swarm into our settlements, and, by herding together, establish their language and manners, to the exclusion of ours? Why should Pennsylvania, founded by the English, become a colony of aliens, who will shortly be so numerous as to Germanize us, instead of our Anglify-

He did not see any way of demolishing Malthus but by first trying to demolish the statement of Franklin. " Dr. Franklin " he says " is in this case particularly the object of our attention, because he was the first man who started the idea of the people of America being multiplied by procreation so as to double every twenty-five years. Dr. Franklin, born in Boston, was eminently an American patriot ; and the paper from which these extracts are taken, was expressly written to exalt the importance and glory of his country," Mr. Godwin, who is open to the suspicion of having taken his knowl-

edge of Franklin's paper at second-hand, and to have never read more of it than was quoted by Malthus, stumbles into a curious blunder as to its date. He says (p. 119) " it was written in 1731 when the author was twenty-five years of age," meaning evidently to imply thereby that it was the work of an immature political economist. The fact was that Franklin's paper was written in 1751, when he was forty-five years of age. Franklin understood what he was writing about much better than Godwin, and time and science have fully justified all the statements which Godwin contested.

ing them, and will never adopt our language or customs any more than they can acquire our complexion?

24. Which leads me to add one remark, that the number of purely white people in the world is proportionably very small. All Africa is black or tawny; Asia chiefly tawny; America (exclusive of the new comers) wholly so. And in Europe, the Spaniards, Italians, French, Russians, and Swedes are generally of what we call a swarthy complexion; as are the Germans also, the Saxons only excepted, who, with the English, make the principal body of white people on the face of the earth. I could wish their numbers were increased. And while we are, as I may call it, scouring our planet, by clearing America of woods, and so making this side of our globe reflect a brighter light to the eyes of inhabitants in Mars or Venus, why should we, in the sight of superior beings, darken its people? Why increase the sons of Africa by planting them in America, where we have so fair an opportunity, by excluding all blacks and tawnys, of increasing the lovely white and red? But perhaps I am partial to the complexion of my country, for such kind of partiality is natural to mankind.

LXXX.

TO JARED ELIOT.

PHILADELPHIA, 12 September, 1751.

DEAR SIR :—I received your favor of last month, with the twelve essays. The Collinson you mention is the same gentleman I correspond with. He is a

most benevolent, worthy man, very curious in botany and other branches of natural history, and fond of improvements in agriculture, etc. He will be pleased with your acquaintance. In the late Philosophical Transactions you may see frequently papers of his, or letters that were directed to him, on various subjects. He is a member of the Royal Society.

An ingenious acquaintance of mine here, Mr. Hugh Roberts, one of our most eminent farmers, tells me that it appears by your writings that your people are yet far behind us in the improvement of swamps and meadows. I am persuading him to send you such hints as he thinks may give you farther insight into that matter. But in other respects he greatly esteems your pieces. He says they are preferable to any thing of late years published on that subject in England. The late writers there chiefly copy from one another, and afford very little new or useful ; but you have collected experiences and facts, and make propositions, that are reasonable and serviceable. You have taught him, he says, to clear his meadows of elder (a thing very pernicious to banks), which was before beyond the art of all our farmers ; and given him several other useful informations.

I am exceedingly obliged to you for the plan and directions concerning ditching. It is very satisfactory, and I hope will be useful here.

Our Academy flourishes beyond expectation. We have now above one hundred scholars, and the number is daily increasing. We have excellent masters at present ; and, as we give pretty good salaries, I hope

we shall always be able to procure such. We pay the

Rector, who teaches Latin and Greek, per annum,	£200
The English master	£150
The Mathematical professor	£125
Three assistant tutors, each £60=	£180
Total per annum	£655

Our currency is something better than that of New York. The scholars pay each £4 per annum.

The changes of the barometer are most sensible in high latitudes. In the West India Islands the mercury continues at the same height with very little variation the year round. In these latitudes, the alterations are not frequently so great as in England, Thermometers are often badly made. I had three that differed widely from each other, though hung in the same place. As to hygrometers, there is no good one yet invented. The cord is as good as any; but, like the rest, it grows continually less sensible by time, so that the observations of one year cannot be compared with those of another by the same instrument. I will think of what you hint concerning the hydrostatic balance.

What you mention concerning the love of praise is indeed very true; it reigns more or less in every heart; though we are generally hypocrites in that respect, and pretend to disregard praise, and our nice, modest ears are offended, forsooth, with what one of the ancients calls *the sweetest kind of music*. This hypocrisy is only a sacrifice to the pride of others, or to their envy; both which, I think, ought rather to be mortified. The same sacrifice we make when we

forbear to *praise ourselves*, which naturally we are all inclined to ; and I suppose it was formerly the fashion, or Virgil, that courtly writer, would not have put a speech into the mouth of his hero, which now-a-days we should esteem so great an indecency :

“Sum pius Æneas,
 famâ super æthera notus.”

One of the Romans, I forget who, justified speaking in his own praise by saying : *Every freeman had a right to speak what he thought of himself, as well as of others.* That this is a natural inclination appears in that all children show it, and say freely : *I am a good boy ; Am I not a good girl ?* and the like, till they have been frequently chid, and told their trumpeter is dead, and that it is unbecoming to sound their own praise, &c. But *naturam expellas furcâ, tamen usque recurret.* Being forbid to praise themselves, they learn instead of it to censure others, which is only a roundabout way of praising themselves ; for condemning the conduct of another, in any particular, amounts to as much as saying : *I am so honest, or wise, or good, or prudent, that I could not do or approve of such an action.* This fondness for ourselves, rather than malice to others, I take to be the general source of censure and backbiting ; and I wish men had not been taught to dam up natural currents, to the overflowing and damage of their neighbours' grounds.

Another advantage, methinks, would arise from freely speaking our good thoughts of ourselves, viz. : if we were wrong in them, somebody or other would

readily set us right ; but now, while we conceal so carefully our vain, erroneous self-opinions, we may carry them to our grave, for who would offer physic to a man that seems to be in health ? And the privilege of recounting freely our own good actions might be an inducement to the doing of them, that we might be enabled to speak of them without being subject to be justly contradicted or charged with falsehood ; whereas now, as we are not allowed to mention them, and it is an uncertainty whether others will take due notice of them or not, we are perhaps the more indifferent about them ; so that, upon the whole, I wish the out-of-fashion practice of praising ourselves would, like other old fashions, come round into fashion again. But this I fear will not be in our time, so we must even be contented with what little praise we can get from one another. And I will endeavour to make you some amends for the trouble of reading this long scrawl, by telling you that I have the sincerest esteem for you, as an ingenious man and a good one, which together make the valuable member of society. As such, I am with great respect and affection, dear Sir, your obliged humble servant,

B. FRANKLIN.

LXXXI.

TO MRS. JANE MECOM.

PHILADELPHIA, 24 October, 1751.

DEAR SISTER :—My son waits upon you with this, whom I heartily recommend to your motherly care and advice. He is indeed a sober and discreet lad of

his years, but he is young and unacquainted with the ways of your place. My compliments to my new niece, Miss Abiah, and pray her to accept the enclosed piece of gold, to cut her teeth ; it may afterwards buy nuts for them to crack.

Some time since I sent a letter to your care for our cousin at Casco Bay. Have you had an opportunity to forward it? My love to brother Mecom and your children ; and to brother and sister Davenport and children ; and respects to Mrs. Billings and her daughter, and all other friends, from, dear sister, your affectionate brother,

B. FRANKLIN.

LXXXII.

TO JARED ELIOT.

PHILADELPHIA, 10 December, 1751.

DEAR SIR :—The rector of our Academy, Mr. Martin, came over to this country on a scheme for making potash, in the Russian method. He promised me some written directions for you, which expecting daily I delayed writing, and now he lies dangerously ill of a kind of quinsy. The surgeons have been obliged to open his windpipe, and introduce a leaden pipe for him to breathe through. I fear he will not recover.

I thank you for the merino wool. It is a curiosity. Mr. Roberts promises me some observations on husbandry for you. It is one Mr. Masters that makes manure of leaves, and not Mr. Roberts. I hope to get the particulars from him soon.

I have a letter from Mr. Collinson, of July 19th, in which he says : " Pray, has Mr. Eliot published any addition to his work ? I have Nos. 1 and 2. If I can get ready, I will send some improvements made in the sandy parts of the county of Norfolk. By the way, *it is a great secret*, but it is Mr. Jackson's own drawing up, being experiments made on some of his father's estates in that county ; but his name must not be mentioned. I thank you for the foul meadow grass. I sowed it June 7th, as soon as I received it, but none is yet come up. I don't know how it is, but I never could raise any of your native grasses ; and I have had a variety from J. Bartram of curious species."

In another, of September 26th, he says : " I am much obliged to thee for Mr. Eliot's Third Essay. I have sent Maxwell's *Select Transactions in Husbandry*. If Mr. Eliot has not seen them, they may be very useful to him. I have prevailed on our worthy, learned, and ingenious friend Mr. Jackson to give some dissertations on the husbandry of Norfolk, believing it may be very serviceable to the colonies. He has great opportunities of doing this, being a gentleman of leisure and fortune, being the only son, whose father has great riches and possessions, and resides every year, all the long vacation, at his father's seat in Norfolk. After J. Bartram has perused it, I shall submit how it may be further disposed of, only our friend Eliot should see it soon ; for Jackson admires his little Tracts of Husbandry, as well as myself, and it may be of greater service to him and his colony, than to yours. The foul

meadow grass has at last made its appearance. Another year we shall judge better of it." Thus far friend Collinson. You may expect the papers in a post or two. If you make any use of them, you will take care not to mention any thing of the author.

The bearer is my son, who desired an opportunity of paying his respects to you in his return from Boston. He went by sea.

They have printed all my electrical papers in England, and sent me a few copies, of which I design to send you one per next post, after having corrected a few errata. I am, dear Sir,

Your most humble servant,

B. FRANKLIN.

P. S.—Mr. Martin is dead.

LXXXIII.

TO JARED ELIOT.

PHILADELPHIA, 24 December, 1751.

DEAR SIR :—I wrote you at large by my son, in answer to your former favors, and sent you an extract from Mr. Collinson's letter, who much admires your Tracts on Husbandry. Herewith you will receive a manuscript of a friend of Mr. Collinson's, and a printed book ; which you may keep till spring, and then return it to me. I believe they will afford you pleasure.

I send you also enclosed a letter from my friend John Bartram, whose Journal you have read. He

corresponds with several of the greatest naturalists in Europe, and will be proud of an acquaintance with you. I make no apologies for introducing him to you ; for, though a plain and illiterate man, you will find he has merit. And since for want of skill in agriculture I cannot converse with you pertinently on that valuable subject, I am pleased that I have procured you two correspondents who can.

I am glad you have introduced English declamation into your college. It will be of great service to the youth, especially if care is taken to form their pronounciation on the best models. Mr. Whittlesey, who was lately here, will tell you that we have little boys under seven, who can deliver an oration with more propriety than most preachers. It is a matter that has been too much neglected.

I am, dear Sir, yours affectionately,

B. FRANKLIN.

LXXXIV.

TO JAMES BOWDOIN.

READ AT THE ROYAL SOCIETY, MAY 27, 1756.

PHILADELPHIA, 24 January, 1752.

SIR :—I am glad to learn by your favor of the 21st past, that Mr. Kinnersley's lectures have been acceptable to the gentlemen of Boston, and are like to prove serviceable to himself.

I thank you for the countenance and encouragement you have so kindly afforded my fellow-citizen.

I send you enclosed an extract of a letter contain-

ing the substance of what I observed concerning the communication of magnetism to needles by electricity. The minutes I took at the time of the experiments are mislaid. I am very little acquainted with the nature of magnetism. Dr. Gawin Knight, inventor of the steel magnets, has wrote largely on that subject ; but I have not yet had leisure to peruse his writings with the attention necessary to become master of his doctrine.

Your explication of the crooked direction of lightning ¹ appears to me both ingenious and solid. When we can account as satisfactorily for the electrification of clouds, I think that branch of natural philosophy will be nearly complete.

The air undoubtedly obstructs the motion of the electric fluid. Dry air prevents the dissipation of an electric atmosphere, the denser the more, as in cold

¹ The explanation here referred to will be found in the following paragraph of a letter written to Franklin by Bowdoin on 21 Dec., 1751. Franklin had in September of the same year given Mr. Kinnersley a letter of introduction to Bowdoin, to pave the way for a course of lectures in Boston on electricity, which Mr. Kinnersley had prepared and delivered in Philadelphia :

“ The electrical fire passing through the air has the same crooked direction as lightning. This appearance I endeavour to account for thus. Air is an electric *per se* ; therefore there must be a mutual repulsion between air and the electrical fire. A column or cylinder of air having the diameter of its base equal to the diameter of the electrical spark, intervenes between that part of the body which the spark is drawn from and that of the body it aims at. The spark acts upon this

column, and is acted upon by it more strongly than any other neighbouring portion of air. The column being thus acted upon, becomes more dense, and, being more dense, repels the spark more strongly ; its repellency being in proportion to its density. Having acquired by being condensed a degree of repellency greater than its natural, it turns the spark out of its straight course ; the neighbouring air, which must be less dense, and therefore has a smaller degree of repellency, giving it a more ready passage. The spark having taken a new direction must now act on, or most strongly repel, the column of air which lies in that direction, and consequently must condense that column in the same manner as the former, when the spark must again change its course, which course will be repeatedly changed, till the spark reaches the body that attracted it.”—ED.

weather. I question whether such an atmosphere can be retained by a body *in vacuo*. A common electrical phial requires a non-electric communication from the wire to every part of the charged glass ; otherwise, being dry and clean, and filled with air only, it charges slowly and discharges gradually by sparks, without a shock ; but, exhausted of air, the communication is so open and free between the inserted wire and surface of the glass, that it charges as readily, and shocks as smartly, as if filled with water ; and I doubt not but that in the experiment you propose the sparks would not only be near straight *in vacuo*, but strike at a greater distance than in the open air, though perhaps there would not be a loud explosion. As soon as I have a little leisure, I will make the experiment and send you the result.

My supposition, that the sea might possibly be the grand source of lightning, arose from the common observation of its luminous appearance in the night, on the least motion ; an appearance never observed in fresh water. Then I knew that the electric fluid may be pumped up out of the earth by the friction of a glass globe on a non-electric cushion ; and that notwithstanding the surprising activity and swiftness of that fluid and the non-electric communication between all parts of the cushion and the earth, yet quantities would be snatched up by the revolving surface of the globe, thrown on the prime conductor, and dissipated in air. How this was done, and why that subtile, active spirit did not immediately return again from the globe into some part or other of the cushion, and so into the

earth, was difficult to conceive ; but whether from its being opposed by a current setting upwards to the cushion, or from whatever other cause, that it did not so return was an evident fact. Then I considered the separate particles of water as so many hard spherules, capable of touching the salt only in points, and imagined a particle of salt could therefore no more be wet by a particle of water, than a globe by a cushion ; that there might therefore be such a friction between these originally constituent particles of salt and water, as in a sea of globes and cushions ; that each particle of water on the surface might obtain, from the common mass, some particles of the universally diffused, much finer, and more subtile electric fluid, and, forming to itself an atmosphere of those particles, be repelled from the then generally electrified surface of the sea, and fly away with them into the air. I thought, too, that possibly the great mixture of particles *electric per se* in the ocean water might, in some degree, impede the swift motion and dissipation of the electric fluid through it to the shores, &c. But having since found, that salt in the water of an electric phial does not lessen the shock ; and having endeavoured in vain to produce that luminous appearance from a mixture of salt and water agitated ; and observed, that even the sea-water will not produce it after some hours' standing in a bottle ; I suspect it to proceed from some principle yet unknown to us (which I would gladly make some experiments to discover, if I lived near the sea), and I grow more doubtful of my former supposition, and more ready

to allow weight to that objection (drawn from the activity of the electric fluid, and the readiness of water to conduct), which you have indeed stated with great strength and clearness.

In the mean time, before we part with this hypothesis, let us think what to substitute in its place. I have sometimes queried, whether the friction of the air, an *electric per se*, in violent winds, among trees, and against the surface of the earth, might not pump up, as so many glass globes, quantities of the electric fluid, which the rising vapors might receive from the air, and retain in the clouds they form; on which I should be glad to have your sentiments. An ingenious friend of mine supposes the land clouds more likely to be electrified than the sea clouds. I send his letter for your perusal, which please to return me.

I have wrote nothing lately on electricity, nor observed any thing new that is material, my time being much taken up with other affairs. Yesterday I discharged four jars through a fine wire, tied up between two strips of glass; the wire was in part melted, and the rest broke into small pieces, from half an inch long to half a quarter of an inch. My globe raises the electric fire with greater ease, in much greater quantities, by the means of a wire extended from the cushion to the iron pin of a pump-handle behind my house, which communicates by the pump-spear with the water in the well.

By this post I send to Dr. Perkins, who is curious in that way, some meteorological observations and conjectures, and desire him to communicate them to

you, as they may afford you some amusement, and I know you will look over them with a candid eye. By throwing our occasional thoughts on paper, we more readily discover the defects of our opinions, or we digest them better, and find new arguments to support them. This I sometimes practise; but such pieces are fit only to be seen by friends.

I am, with great respect, &c.,

B. FRANKLIN.

LXXXV.

TO E. KINNERSLEY, AT BOSTON.¹

PHILADELPHIA, 2 March, 1752.

SIR:—I thank you for the experiments communicated.² I sent immediately for your brimstone globe,

¹ The Rev. Ebenezer Kinnersley was a professor in the College of Philadelphia.—EDITOR.

² The experiments here referred to were described in the following letter from Mr. Kinnersley to Dr. Franklin:

[BOSTON] 3 February, 1752.

SIR:—I have the following experiments to communicate. I held in one hand a wire, which was fastened at the other end to the handle of a pump, in order to try whether the stroke from the prime conductor, through my arms, would be any greater than when conveyed only to the surface of the earth, but could discover no difference.

I placed the needle of a compass on the point of a long pin, and, holding it in the atmosphere of the prime conductor, at the distance of about three inches, found it to whirl round like the flyers of a jack, with great rapidity.

I suspended with silk a cork ball, about the bigness of a pea, and presented to it rubbed amber, sealing-wax, and sulphur, by each of which it

was strongly repelled; then I tried rubbed glass and China, and found that each of these would attract it, until it became electrified again, and then it would be repelled as at first; and while thus repelled by the rubbed glass or China, either of the others when rubbed would attract it. Then I electrified the ball with the wire of a charged phial, and presented to it rubbed glass (the stopper of a decanter) and a China tea-cup, by which it was as strongly repelled as by the wire; but when I presented either of the other rubbed electrics, it would be strongly attracted, and when I electrified it by either of these, till it became repelled, it would be attracted by the wire of the phial, but be repelled by its coating.

These experiments surprised me very much, and have induced me to infer the following paradoxes:

1. If a glass globe be placed at one end of a prime conductor, and a sulphur one at the other end, both being equally in good order, and in equal

in order to make the trials you desired, but found it wanted centres, which I have not time now to supply ; but, the first leisure, I will get it fitted for use, try the experiments, and acquaint you with the result.

In the mean time I suspect that the different attractions and repulsions you observed, proceeded rather from the greater or smaller quantities of the fire you obtained from different bodies, than from its being of a different *kind*, or having a different *direction*. In haste, I am, &c.,

B. FRANKLIN.

LXXXVI.

TO E. KINNERSLEY, AT BOSTON.

PHILADELPHIA, 16 March, 1752.

SIR :—Having brought your brimstone globe to work, I tried one of the experiments you proposed, and was agreeably surprised to find that the glass globe being at one end of the conductor, and the sulphur globe at the other end, both globes in mo-

tion, not a spark of fire can be obtained from the conductor ; but one globe will draw out as fast as the other gives in.

2. If a phial be suspended on the conductor, with a chain from its coating to the table, and only one of the globes be made use of at a time, twenty turns of the wheel, for instance, will charge it ; after which, so many turns of the other wheel will discharge it, and as many more will charge it again.

3. The globes being both in motion, each having a separate conductor, with a phial suspended on one of them, and the chain of it fastened to the other, the phial will become charged ;

one globe charging positively, the other negatively.

4. The phial being thus charged, hang it in like manner on the other conductor, set both wheels a going again, and the same number of turns that charged it before will now discharge it, and the same number repeated will charge it again.

5. When each globe communicates with the same prime conductor, having a chain hanging from it to the table, one of them, when in motion (but which I cannot say), will draw fire up through the cushion, and discharge it through the chain ; the other will draw it up through the chain, and discharge it through the cushion.

tion, no spark could be obtained from the conductor, unless when one globe turned slower, or was not in so good order as the other ; and then the spark was only in proportion to the difference, so that turning equally, or turning that slowest which worked best, would again bring the conductor to afford no spark.

I found also that the wire of a phial charged by the glass globe, attracted a cork ball that had touched the wire of a phial charged by the brimstone globe, and *vice versâ*, so that the cork continued to play between the two phials, just as when one phial was charged through the wire, the other through the coating, by the glass globe alone. And two phials charged, the one by the brimstone globe, the other by the glass globe, would be both discharged by bringing their wires together, and shock the person holding the phials.

From these experiments one may be certain that your second, third, and fourth proposed experiments would succeed exactly as you suppose, though I have not tried them, wanting time. I imagine it is the glass globe that charges positively, and the sulphur negatively, for these reasons. 1. Though the sulphur globe seems to work equally well with the glass one, yet it can never occasion so large and distant a spark between my knuckle and the conductor, when the sulphur one is working, as when the glass one is used ; which, I suppose, is occasioned by this, that bodies of a certain bigness cannot so easily part with a quantity of electrical fluid they have and hold attracted *within* their substance, as they can receive

an additional quantity *upon* their surface by way of atmosphere. Therefore so much cannot be drawn *out* of the conductor, as can be thrown *on* it. 2. I observe that the stream or brush of fire appearing at the end of a wire connected with the conductor, is long, large, and much diverging, when the glass globe is used, and makes a snapping (or rattling) noise ; but when the sulphur one is used, it is short, small, and makes a hissing noise ; and just the reverse of both happens, when you hold the same wire in your hand, and the globes are worked alternately : the brush is large, long, diverging, and snapping (or rattling), when the sulphur globe is turned ; short, small, and hissing, when the glass globe is turned. When the brush is long, large, and much diverging, the body to which it joins seems to me to be throwing the fire out ; and when the contrary appears, it seems to be drinking in. 3. I observe that when I hold my knuckle before the sulphur globe, while turning, the stream of fire between my knuckle and the globe seems to spread on its surface, as if it flowed from the finger ; on the glass globe it is otherwise. 4. The cool wind (or what was called so), that we used to feel as coming from an electrified point, is, I think, more sensible when the glass globe is used, than when the sulphur one. But these are hasty thoughts. As to your fifth paradox, it must likewise be true, if the globes are alternately worked ; but, if worked together, the fire will neither come up nor go down by the chain, because one globe will drink it as fast as the other produces it.

I should be glad to know whether the effects would be contrary, if the glass globe is solid, and the sulphur globe is hollow; but I have no means at present of trying.

In your journeys, your glass globes meet with accidents, and sulphur ones are heavy and inconvenient. *Query.* Would not a thin plane of brimstone, cast on a board, serve on occasion as a cushion, while a globe of leather stuffed (properly mounted) might receive the fire from the sulphur, and charge the conductor positively? Such a globe would be in no danger of breaking.¹ I think I can conceive how it may be done; but have not time to add more than that I am,

Yours, &c.,

B. FRANKLIN.

LXXXVII.

TO CADWALLADER COLDEN.

READ AT THE ROYAL SOCIETY, NOVEMBER 11, 1756.

PHILADELPHIA, 23 April, 1752.

SIR:—In considering your favor of the 16th past, I recollected my having wrote you answers to some queries concerning the difference between *electrics per se* and *non-electrics*, and the effects of air in electrical experiments, which, I apprehend, you may not have received. The date I have forgotten.

We have been used to call those bodies *electrics*

¹ The discoveries of the late ingenious Mr. Symmer, on the positive and negative electricity produced by the

mutual friction of white and black silk, etc., afford hints for farther improvements to be made with this view.—F.

per se, which would not conduct the electric fluid. We once imagined that only such bodies contained that fluid ; afterwards that they had none of it, and only educed it from other bodies ; but further experiments showed our mistake. It is to be found in all matter we know of ; and the distinction of *electrics per se* and *non-electrics* should now be dropped as improper, and that of *conductors* and *non-conductors* assumed in its place, as I mentioned in those answers.

I do not remember any experiment by which it appeared that high-rectified spirit will not conduct ; perhaps you have made such. This I know, that wax, rosin, brimstone, and even glass, commonly reputed *electrics per se*, will, when in a fluid state, conduct pretty well. Glass will do it when only red-hot. So that my former position, that only metals and water were conductors, and other bodies more or less such as they partook of metal or moisture, was too general.

Your conception of the electric fluid, that it is incomparably more subtile than air, is undoubtedly just. It pervades dense matter with the greatest ease ; but it does not seem to mix or incorporate willingly with mere air, as it does with other matter. It will not quit common matter to join with air. Air obstructs, in some degree, its motion. An electric atmosphere cannot be communicated at so great a distance, by far, through intervening air as through a vacuum. Who knows, then, but there may be, as the ancients thought, a region of this fire above our atmosphere, prevented by our air and its own too great distance for attraction, from joining our earth ?

Perhaps where the atmosphere is rarest this fluid may be densest, and nearer the earth, where the atmosphere grows denser, this fluid may be rarer, yet some of it be low enough to attach itself to our highest clouds, and thence they, becoming electrified may be attracted by and descend towards the earth and discharge their watery contents, together with that ethereal fire. Perhaps the *auroræ boreales* are currents of this fluid in its own region, above our atmosphere, becoming from their motion, visible. There is no end to conjectures. As yet we are but novices in this branch of natural knowledge.

You mention several differences of salts in electrical experiments. Were they all equally dry? Salt is apt to acquire moisture from a moist air, and some sorts more than others. When perfectly dried by lying before a fire, or on a stove, none that I have tried will conduct any better than so much glass.

New flannel, if dry and warm, will draw the electric fluid from *non-electrics*, as well as that which has been worn.

I wish you had the convenience of trying the experiments you seem to have such expectations from, upon various kinds of spirits, salts, earth, &c. Frequently, in a variety of experiments, though we miss what we expected to find, yet something valuable turns out, something surprising and instructing, though unthought of.

I thank you for communicating the illustration of the theorem concerning light. It is very curious. But I must own I am much in the *dark* about *light*. I

am not satisfied with the doctrine that supposes particles of matter, called light, continually driven off from the sun's surface, with a swiftness so prodigious! Must not the smallest particle conceivable have, with such a motion, a force exceeding that of a twenty-four pounder discharged from a cannon? Must not the sun diminish exceedingly by such a waste of matter; and the planets, instead of drawing nearer to him, as some have feared, recede to greater distances through the lessened attraction? Yet these particles, with this amazing motion, will not drive before them, or remove the least and lightest dust they meet with. And the sun, for aught we know, continues of his ancient dimensions, and his attendants move in their ancient orbits.

May not all the phenomena of light be more conveniently solved, by supposing universal space filled with a subtile elastic fluid, which, when at rest, is not visible, but whose vibrations affect that fine sense in the eye, as those of air do the grosser organs of the ear? We do not, in the case of sound, imagine that any sonorous particles are thrown off from a bell, for instance, and fly in straight lines to the ear; why must we believe that luminous particles leave the sun and proceed to the eye? (Some diamonds, if rubbed, shine in the dark, without losing any part of their matter. I can make an electrical spark as big as the flame of a candle, much brighter, and therefore, visible farther; yet this is without fuel; and I am persuaded no part of the electric fluid flies off in such case to distant places, but all goes directly, and is to

be found in the place to which I destine it.) May not different degrees of the vibration of the above-mentioned universal medium occasion the appearances of different colors? I think the electric fluid is always the same; yet I find that weaker and stronger sparks differ in apparent color; some white, blue, purple, red; the strongest, white; weak ones, red. Thus different degrees of vibration given to the air produce the seven different sounds in music, analogous to the seven colors, yet the medium, air, is the same.

If the sun is not wasted by expense of light, I can easily conceive that he shall otherwise always retain the same quantity of matter; though we should suppose him made of sulphur constantly flaming. The action of fire only *separates* the particles of matter; it does not *annihilate* them. Water, by heat raised in vapor, returns to the earth in rain; and if we could collect all the particles of burning matter that go off in smoke, perhaps they might, with the ashes, weigh as much as the body before it was fired; and if we could put them into the same position with regard to each other, the mass would be the same as before, and might be burnt over again. The chemists have analyzed sulphur, and find it composed, in certain proportions, of oil, salt, and earth; and having by the analysis discovered those proportions, they can, of those ingredients, make sulphur. So we have only to suppose, that the parts of the sun's sulphur, separated by fire, rise into his atmosphere, and there, being freed from the immediate action of the fire, they collect into cloudy masses, and growing by

degrees too heavy to be longer supported, they descend to the sun and are burnt over again. Hence the spots appearing on his face, which are observed to diminish daily in size, their consuming edges being of particular brightness.

It is well we are not, as poor Galileo was, subject to the Inquisition for *philosophical heresy*. My whispers against the orthodox doctrine, in private letters, would be dangerous; but your writing and printing would be highly criminal. As it is, you must expect some censure; but one heretic will surely excuse another.

I am heartily glad to hear more instances of the success of the poke-weed in the cure of that horrible evil to the human body, a cancer. You will deserve highly of mankind for the communication. But I find in Boston they are at a loss to know the right plant, some asserting it is what they call *mechoachan*, others other things. In one of their late papers it is publicly requested that a perfect description may be given of the plant, its places of growth, &c. I have mislaid the paper, or would send it to you. I thought you had described it pretty fully. I am, Sir, &c.,

B. FRANKLIN.

LXXXVIII.

TO CADWALLADER COLDEN.

PHILADELPHIA, 14 May, 1752.

SIR:—I find P—— has been indiscreet enough to print a piece in his paper which has brought him into

a great deal of trouble. I cannot conceive how he was prevailed on to do it, as I know him to be a thorough believer himself, and averse to every thing that is commonly called *freethinking*. He is now much in his penitentials, and requests me to intercede with you, to procure from the governor a *Nol. Pros.* in his favor, promising to be very circumspect and careful for the future, not to give offence either in religion or politics, to you or any of your friends, in which, I believe, he is very sincere.

I have let him know that I pretend to no interest with you, and I fear he has behaved to the governor and to you in such a manner as not to deserve your favor. Therefore I only beg leave to recommend the poor man's case to your consideration ; and if you could, without inconvenience to your own character, interest yourself a little in his behalf, I shall, as I am much concerned for him, esteem it a very great obligation.

As to the cause of religion, I really think it will be best served by stopping the prosecution ; for, if there be any evil tendency apprehended from the publication of that piece, the trial and punishment of the printer will certainly make it a thousand times more public,—such is the curiosity of mankind in these cases. It is, besides, an old thing, has been printed before both in England and by Andrew Bradford here ; but, no public notice being taken of it, it died and was forgotten, as I believe it would now be, if treated with the same indifference. I am with great respect, &c.

B. FRANKLIN.

LXXXIX.

TO EDWARD AND JANE MECOM.

PHILADELPHIA, 21 May, 1752.

DEAR BROTHER AND SISTER :

I received yours with the affecting news of our dear good mother's death. I thank you for your long continued care of her in her old age and sickness. Our distance made it impracticable for us to attend her, but you have supplied all. She has lived a good life, as well as a long one, and is happy.

Since I sent you the order on Mr. Huske, I have received his account, and find he thinks he has money to receive, and though I endeavour by this post to convince him he is mistaken, yet possibly he may not be immediately satisfied, so as to pay that order ; therefore, lest the delay should be inconvenient to you, I send the six pistoles enclosed. But if the order is paid, give those to brother John, and desire him to credit my account with them. Your affectionate brother,

B. FRANKLIN.

XC.

TO JOHN PERKINS.¹

PHILADELPHIA, 13 August, 1752.

SIR:—I received your favor of the 3d instant. Some time last winter I procured from one of our physicians an account of the number of persons inoculated during the five visitations of the small-pox

¹ Dr. Perkins, of Boston, had asked Franklin for the number that had died of inoculation in Philadelphia, at

the instance of Dr. Douglass, who designed to write something on the small-pox.

we have had in twenty-two years ; which account I sent to Mr. W. V., of your town, and have no copy. If I remember rightly, the number exceeded eight hundred, and the deaths were but four. I suppose Mr. V. will show you the account, if he ever received it. These four were all that our doctors allow to have died of the small-pox by inoculation, though I think there were two more of the inoculated who died of the distemper ; but the eruptions appearing soon after the operation, it is supposed they had taken the infection before in the common way.

I shall be glad to see what Dr. Douglass may write on the subject. I have a French piece printed at Paris, 1724, entitled, *Observations sur la Saignée du Pied, et sur la Purgation, au Commencement de la Petite Vérole, et Raisons de doute contre l'Inoculation*. A letter of the Doctor's is mentioned in it. If he or you have it not, and desire to see it, I will send it. Please to favor me with the particulars of your purging method, to prevent the secondary fever.

I am indebted for your preceding letter, but business sometimes obliges one to postpone philosophical amusements. Whatever I have wrote of that kind are really, as they are entitled, but *Conjectures* and *Suppositions* ; which ought always to give place, when careful observation militates against them. I own I have too strong a *penchant* to the building of hypotheses ; they indulge my natural indolence. I wish I had more of your patience and accuracy in making observations, on which alone true philosophy can be founded. And, I assure you, nothing can be more

obliging to me than your kind communication of those you make, however they may disagree with my preconceived notions.

I am sorry to hear, that the number of your inhabitants decreases. I some time since wrote a small paper of *Thoughts on the Peopling of Countries*, which, if I can find, I will send you, to obtain your sentiments. The favorable opinion you express of my writings may, you see, occasion you more trouble than you expected from,

Sir, yours, &c.

B. FRANKLIN.

XCI.

TO CADWALLADER COLDEN.¹

PHILADELPHIA, 14 September, 1752.

DEAR SIR:—When I had read your favor of May the 20th, I resolved to read and consider more carefully Sir Isaac Newton's *Optics*, which I have not looked at these many years. I delayed answering till I should have an opportunity of doing this, but one thing or other has hitherto hindered. In the winter I may possibly have more leisure.

In the mean time I would just mention that the interposition of a hill between a bell and the ear does interrupt a great part of the sound, though not all ; and we cannot be certain that an opaque body placed between the eye and a luminous object intercepts all the light, since, as you observe, it does not follow that where we see no light there is therefore none

¹ See this paper *Supra.*, p. 223.

existing. What you say of the separation of the distinct parts of light, which, once separated, remain always the same, has more weight with me, and indeed seems conclusive ; at least, I see at present nothing to object.

I congratulate you on the prospect you have, of passing the remainder of life in philosophical retirement. I wish for the same, but it seems too distant. I might then more punctually perform my part in the correspondence you honor me with ; than which I have none more instructive or agreeable.

Send me, if you please, the translation of your piece into High Dutch. I understand a little of the German language, and will peruse and return it. At present I cannot guess the meaning of the passage you mention. Unless perhaps, as your twentieth section speaks of "a power that neither resists nor moves, and exerts no kind of action of itself, without the concurrence of some other power ; so that in the absence of other powers it must be in a perfect inaction," &c., it may be some kind of Dutch wit, and intended to joke that *quietism* which in Germany is supposed to be very prevalent in Pennsylvania, many of their Quietists¹ having removed hither.

I see by Cave's *Magazine* for May that they have translated my electrical papers into French, and printed them in Paris. I hope our friend Collinson will procure and send me a copy of the translation. Such things should be done by men skilled in the

¹ This is the only evidence in our literature, so far as I know, that any of this sect, for whose principles Fen-

elon suffered and Molinos died, ever found a refuge in the United States.
—ED.

subject as well as in the language, otherwise great mistakes are easily made, and the clearest matters rendered obscure and unintelligible.

XCII.

TO PETER COLLINSON.

READ AT THE ROYAL SOCIETY, DECEMBER 21, 1752.

PHILADELPHIA, 19 October, 1752.

SIR :—As frequent mention is made in publick papers from Europe of the success of the Philadelphia experiment for drawing the electric fire from clouds by means of pointed rods of iron erected on high buildings, &c., it may be agreeable to the curious to be informed that the same experiment has succeeded in Philadelphia, though made in a different and more easy manner, which is as follows.

Make a small cross of two light strips of cedar, the arms so long as to reach to the four corners of a large thin silk handkerchief when extended ; tie the corners of the handkerchief to the extremities of the cross, so you have the body of a kite ; which, being properly accommodated with a tail, loop, and string, will rise in the air, like those made of paper ; but this being of silk is fitter to bear the wet and wind of a thunder-gust without tearing. To the top of the upright stick of the cross is to be fixed a very sharp-pointed wire, rising a foot or more above the wood. To the end of the twine, next the hand, is to be tied a silk ribbon, and where the silk and twine join, a key may

be fastened. This kite is to be raised when a thunder-gust appears to be coming on, and the person who holds the string must stand within a door or window, or under some cover, so that the silk ribbon may not be wet ; and care must be taken that the twine does not touch the frame of the door or window. As soon as any of the thunder-clouds come over the kite, the pointed wire will draw the electric fire from them, and the kite, with all the twine, will be electrified, and the loose filaments of the twine will stand out every way, and be attracted by an approaching finger. And when the rain has wetted the kite and twine, so that it can conduct the electric fire freely, you will find it stream out plentifully from the key on the approach of your knuckle. At this key the phial may be charged ; and from electric fire thus obtained spirits may be kindled, and all the other electric experiments be performed which are usually done by the help of a rubbed glass globe or tube, and thereby the sameness of the electric matter with that of lightning completely demonstrated.

B. FRANKLIN.

XCIII.

TO EDWARD AND JANE MECOM.

PHILADELPHIA, 14 November, 1752.

DEAR BROTHER AND SISTER :

Benny sailed from hence this day two weeks, and left our Capes the Sunday following. They are seldom above three weeks on the voyage to Antigua.

That island is reckoned one of the healthiest in the

West Indies. My late partner there enjoyed perfect health for four years, till he grew careless, and got to sitting up late in taverns, which I have cautioned Benny to avoid, and have given him all other necessary advice I could think of, relating both to his health and conduct, and I hope for the best.

He will find the business settled to his hand : a newspaper established, no other printing-house to interfere with him, or beat down his prices, which are much higher than we get on the continent. He has the place on the same terms with his predecessor, who, I understand, cleared from five to six hundred pistoles during the four years he lived there. I have recommended him to some gentlemen of note for their patronage and advice.

Mr. Parker, though he looked on Benny as one of his best hands, readily consented to his going, on the first mention of it. I told him Benny must make him satisfaction for his time. He would leave that to be settled by me, and Benny as readily agreed with me to pay Mr. Parker as much as would hire a good journeyman in his room. He came handsomely provided with apparel, and I believe Mr. Parker has, in every respect, done his duty by him, and in this affair has really acted a generous part ; therefore I hope, if Benny succeeds in the world, he will make Mr. Parker a return beyond what he has promised. I suppose you will not think it amiss to write Mr. and Mrs. Parker a line or two of thanks ; for, notwithstanding some little differences, they have on the whole been very kind to Benny.

We have vessels going very frequently from this port to Antigua. You have some too from your port. What letters you send this way I will take care to forward. Antigua is the seat of government for all the Leeward Islands, to wit, St. Christopher's, Nevis, and Montserrat. Benny will have the business of all those islands, there being no other printer.

After all, having taken care to do *what appears to be for the best*, we must submit to God's providence, which orders all things really for the best.

While Benny was here, and since, our Assembly was sitting, which took up my time, and I could not before write you so fully.

With love to your children, I am, dear brother and sister, your affectionate brother,

B. FRANKLIN.

XCIV.

TO CADWALLADER COLDEN.

PHILADELPHIA, 1 January, 1753.

DEAR SIR:—I have your favor of the third past, with your son's remarks on the Abbé Nollet's *Letters*. I think the experiments and observations are judiciously made and so well expressed that, with your and his leave, I would transmit them to Mr. Collinson for publication. I have repeated all the Abbé's experiments *in vacuo*, and find them answer exactly as they should do on my principles, and in the material part quite contrary to what he has related of them;

so that he has laid himself extremely open by attempting to impose false accounts of experiments on the world to support his doctrine.

M. Dalibard wrote to me that he was preparing an answer that would be published the beginning of this winter; but as he seems to have been imposed on by the Abbé's confident assertion, that a charged bottle set down on an *electric per se* is deprived of its electricity, and in his letter to me attempts to account for it, I doubt he is not yet quite master of the subject to do the business effectually. So I conclude to write a civil letter to the Abbé myself, in which, without resenting any thing in his letters, I shall endeavour to set the disputed matters in so clear a light as to satisfy every one who will take the trouble of reading it. Before I send it home, I shall communicate it to you, and take your friendly advice on it. I set out to-morrow on a journey to Maryland, where I expect to be some weeks, but shall have some leisure when I return. At present I can only add my thanks to your ingenious son, and my hearty wishes of a happy new year to you, and him, and all yours. I am, Sir, &c.

B. FRANKLIN.

P. S.—I wrote to you last post, and sent my paper on the *Increase of Mankind*. I send the Supplemental Electrical Experiments in several fragments of letters, of which Cave¹ has made the most, by printing some of them twice over.

¹ The bookseller in London, who first published Franklin's papers on electricity.

XCV.

TO JOHN PERKINS.

READ AT THE ROYAL SOCIETY, JUNE 24, 1756.

PHILADELPHIA, 4 February, 1753.

SIR :—I ought to have written to you long since, in answer to yours of October 16th concerning the water-spout ; but business partly, and partly a desire of procuring further information by inquiry among my sea-faring acquaintance, induced me to postpone writing from time to time, till I am now almost ashamed to resume the subject, not knowing but you may have forgot what has been said upon it.

Nothing certainly can be more improving to a searcher into nature than objections judiciously made to his opinion, taken up, perhaps, too hastily ; for such objections oblige him to re-study the point, consider every circumstance carefully, compare facts, make experiments, weigh arguments, and be slow in drawing conclusions. And hence a sure advantage results ; for he either confirms a truth, before too slightly supported, or discovers an error, and receives instruction from the objector.

In this view I consider the objections and remarks you sent me, and thank you for them sincerely ; but how much soever my inclinations lead me to philosophical inquiries, I am so engaged in business, public and private, that those more pleasing pursuits are frequently interrupted, and the chain of thought, necessary to be closely continued in such disquisitions, is so broken and disjointed that it is with difficulty I

satisfy myself in any of them ; and I am now not much nearer a conclusion in this matter of the spout than when I first read your letter.

Yet, hoping we may in time sift out the truth between us, I will send you my present thoughts, with some observations on your reasons on the accounts in the *Transactions*, and on other relations I have met with. Perhaps while I am writing some new light may strike me, for I shall now be obliged to consider the subject with a little more attention.

I agree with you that, by means of a vacuum in a whirlwind, water cannot be supposed to rise in large masses to the region of the clouds ; for the pressure of the surrounding atmosphere could not force it up in a continued body or column to a much greater height than thirty feet. But if there really is a vacuum in the centre, or near the axis of whirlwinds, then, I think, water may rise in such vacuum to that height, or to a less height, as the vacuum may be less perfect.

I had not read Stuart's account in the *Transactions* for many years before the receipt of your letter, and had quite forgot it ; but now, on viewing his drafts and considering his descriptions, I think they seem to favor *my hypothesis* ; for he describes and draws columns of water, of various heights, terminating abruptly at the top, exactly as water would do when forced up by the pressure of the atmosphere into an exhausted tube.

I must, however, no longer call it *my hypothesis*, since I find Stuart had the same thought, though somewhat obscurely expressed, where he says, " he

imagines this phenomenon may be solved by suction (improperly so called), or rather pulsion, as in the application of a cupping-glass to the flesh, the air being first voided by the kindled flax."

In my paper, I supposed a whirlwind and a spout to be the same thing, and to proceed from the same cause; the only difference between them being that the one passes over land, the other over water. I find also in the *Transactions* that M. de la Pryme was of the same opinion; for he there describes two spouts, as he calls them, which were seen at different times, at Hatfield, in Yorkshire, whose appearances in the air were the same with those of the spouts at sea, and effects the same with those of real whirlwinds.

Whirlwinds have generally a progressive as well as a circular motion; so had what is called the spout, at Topsham (see the account of it in the *Transactions*), which also appears, by its effects described, to have been a real whirlwind. Water-spouts have, also, a progressive motion; this is sometimes greater and sometimes less; in some violent, in others barely perceivable. The whirlwind at Warrington continued long in Acrement Close.

Whirlwinds generally arise after calms and great heats; the same is observed of water-spouts, which are therefore most frequent in the warm latitudes. The spout that happened in cold weather, in the Downs, described by Mr. Gordon in the *Transactions*, was, for that reason, thought extraordinary; but he remarks withal, that the weather, though cold when

the spout appeared, was soon after much colder ; as we find it, commonly, less warm after a whirlwind.

You agree, that the wind blows every way towards a whirlwind, from a large space round. An intelligent whaleman, of Nantucket, informed me, that three of their vessels, which were out in search of whales, happening to be becalmed, lay in sight of each other, at about a league distance, if I remember right, nearly forming a triangle ; after some time a water-spout appeared near the middle of the triangle, when a brisk breeze of wind sprung up, and every vessel made sail ; and then it appeared to them all, by the setting of the sails, and the course each vessel stood, that the spout was to the leeward of every one of them ; and they all declared it to have been so, when they happened afterwards in company, and came to confer about it. So that in this particular likewise, whirlwinds and water-spouts agree.

But if that which appears a water-spout at sea does sometimes, in its progressive motion, meet with and pass over land, and there produce all the phenomena and effects of a whirlwind, it should thence seem still more evident, that a whirlwind and a spout are the same. I send you herewith a letter from an ingenious physician of my acquaintance, which gives one instance of this, that fell within his observation.

A fluid, moving from all points horizontally towards a centre, must at that centre either ascend or descend. Water being in a tub, if a hole be opened in the middle of the bottom, will flow from all sides to the centre, and there descend in a whirl. But air,

flowing on and near the surface of land or water, from all sides towards the centre, must at the centre ascend, the land or water hindering its descent.

If these concentrating currents of air be in the upper region, they may indeed descend in the spout or whirlwind; but then, when the united current reached the earth or water, it would spread, and probably blow every way from the centre. There may be whirlwinds of both kinds, but from the commonly observed effects I suspect the rising one to be the most common; when the upper air descends, it is perhaps in a greater body extended wider, as in our thunder-gusts, and without much whirling; and when air descends in a spout or whirlwind, I should rather expect it would press the roof of a house *inwards*, or force *in* the tiles, shingles, or thatch, force a boat down into the water, or a piece of timber into the earth, than that it would lift them up and carry them away.

It has so happened that I have not met with any accounts of spouts that certainly descended; I suspect they are not frequent. Please to communicate those you mention. The apparent dropping of a pipe from the clouds towards the earth or sea, I will endeavour to explain hereafter.

The augmentation of the cloud, which, as I am informed, is generally if not always the case during a spout, seems to show an ascent, rather than a descent, of the matter of which such cloud is composed; for a descending spout, one would expect, should diminish a cloud. I own, however, that cold air de-

scending may, by condensing the vapors in a lower region, form and increase clouds; which, I think, is generally the case in our common thunder-gusts, and therefore do not lay great stress on this argument.

Whirlwinds and spouts are not always, though most commonly, in the day time. The terrible whirlwind which damaged a great part of Rome, June 11, 1749, happened in the night of that day. The same was supposed to have been first a spout, for it is said to be beyond doubt, that it gathered in the neighbouring sea, as it could be tracked from Ostia to Rome. I find this in Père Boscovich's account of it, as abridged in the *Monthly Review* for December, 1750.

In that account, the whirlwind is said to have appeared as a very black, long, and lofty cloud, discoverable, notwithstanding the darkness of the night, by its continually lightning or emitting flashes on all sides, pushing along with a surprising swiftness, and within three or four feet of the ground. Its general effects on houses were, stripping off the roofs, blowing away chimneys, breaking doors and windows, *forcing up the floors, and unpaving the rooms*, (some of these effects seem to agree well with a supposed vacuum in the centre of the whirlwind,) and the very rafters of the houses were broken and dispersed, and even hurled against houses at a considerable distance, &c.

It seems, by an expression of Père Boscovich's, as if the wind blew from all sides towards the whirlwind; for, having carefully observed its effects, he

concludes of all whirlwinds, "that their motion is circular, and their action attractive."

He observes, on a number of histories of whirlwinds, &c., "that a common effect of them is to carry up into the air tiles, stones, and animals themselves, which happened to be in their course, and all kinds of bodies unexceptionably, throwing them to a considerable distance, with great impetuosity."

Such effects seem to show a rising current of air.

I will endeavour to explain my conceptions of this matter by figures, representing a plan, and an elevation of a spout or whirlwind.

I would only first beg to be allowed two or three positions, mentioned in my former paper.

1. That the lower region of air is often more heated, and so more rarefied, than the upper ; consequently, specifically lighter. The coldness of the upper region is manifested by the hail, which sometimes falls from it in a hot day.

2. That heated air may be very moist and yet the moisture so equally diffused and rarefied as not to be visible till colder air mixes with it when it condenses and becomes visible. Thus our breath, invisible in summer, becomes visible in winter.

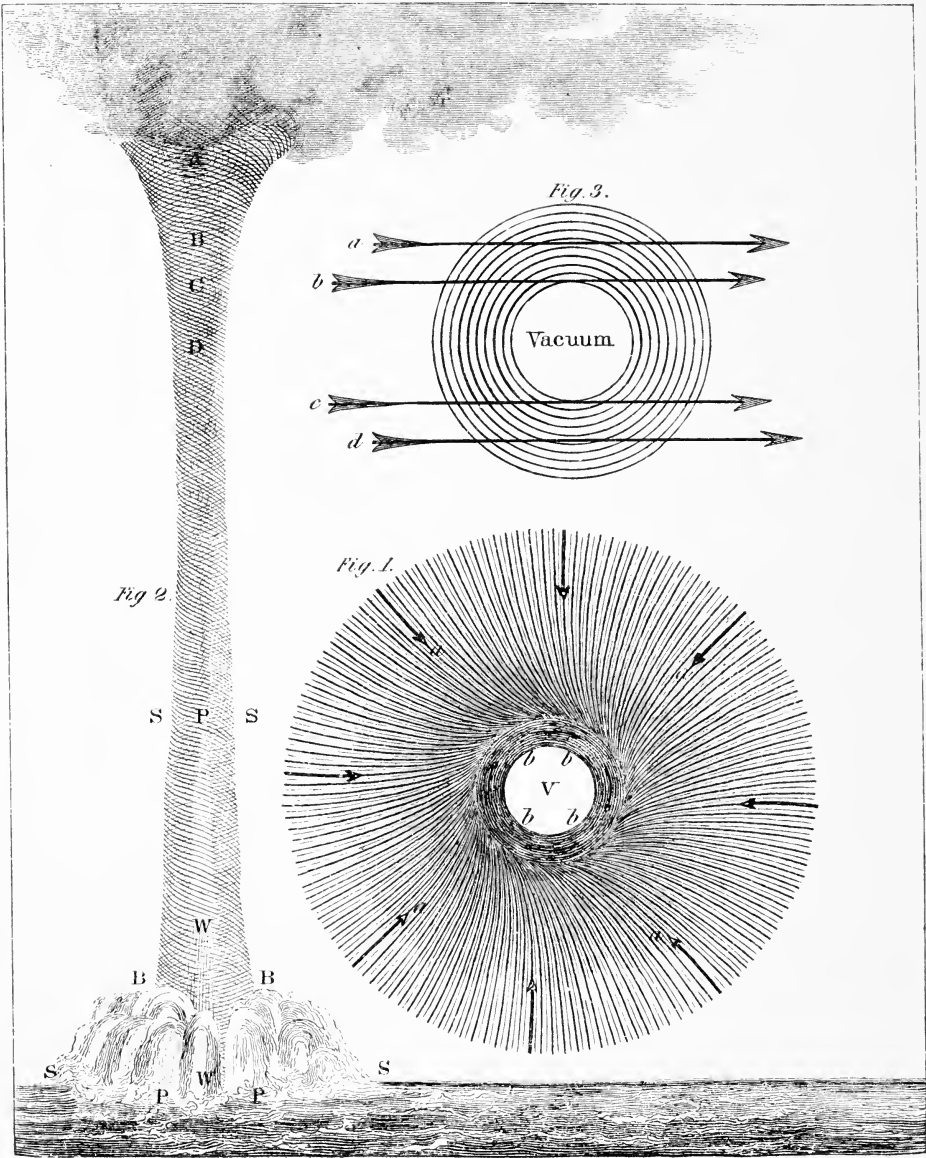
Now let us suppose a tract of land, or sea, of perhaps sixty miles square, unscreened by clouds, and unfanned by winds, during great part of a summer's day, or, it may be, for several days successively, till it is violently heated, together with the lower region of air in contact with it, so that the said lower air becomes specifically lighter than the superincumbent

higher region of the atmosphere, in which the clouds commonly float ; let us suppose, also, that the air surrounding this tract has not been so much heated during those days, and therefore remains heavier. The consequence of this should be, as I conceive, that the heated, lighter air, being pressed on all sides, must ascend, and the heavier descend ; and as this rising cannot be in all parts, or the whole area, of the tract at once, for that would leave too extensive a vacuum, the rising will begin precisely in that column that happens to be the lightest or most rarefied ; and the warm air will flow horizontally from all points to this column, where the several currents meeting, and joining to rise, a whirl is naturally formed, in the same manner as a whirl is formed in the tub of water, by the descending fluid flowing from all sides of the tub to the hole in the centre.

And as the several currents arrive at this central rising column with a considerable degree of horizontal motion, they cannot suddenly change it to a vertical motion ; therefore as they gradually, in approaching the whirl, decline from right to curve or circular lines, so, having joined the whirl, they *ascend* by a spiral motion, in the same manner as the water *descends* spirally through the hole in the tub before-mentioned.

Lastly, as the lower air, and nearest the surface, is most rarefied by the heat of the sun, that air is most acted on by the pressure of the surrounding cold and heavy air, which is to take its place ; consequently its motion towards the whirl is swiftest, and so the force

WATER SPOUT.



of the lower part of the whirl, or trump, strongest, and the centrifugal force of its particles greatest; and hence the vacuum round the axis of the whirl should be greatest near the earth or sea, and be gradually diminished as it approaches the region of the clouds, till it ends in a point, as at *P*, in Figure 2, Plate IV., forming a long and sharp cone.

In Figure 1, which is a plan or ground-plat of a whirlwind, the circle *V* represets the central vacuum.

Between *a a a a* and *b b b b*, I suppose a body of air, condensed strongly by the pressure of the currents moving towards it from all sides without, and by its centrifugal force from within, moving round with prodigious swiftness (having, as it were, the momenta of all the currents, —> —> —> —>, united in itself), and with a power equal to its swiftness and density.

It is this whirling body of air between *a a a a* and *b b b b* that rises spirally; by its force it tears buildings to pieces, twists up great trees by the roots, &c., and by its spiral motion raises the fragments so high, till the pressure of the surrounding and approaching currents, diminishing, can no longer confine them to the circle, or their own centrifugal force, increasing, grows too strong for such pressure, when they fly off in tangent lines, as stones out of a sling, and fall on all sides and at great distances.

If it happens at sea, the water under and between *a a a a* and *b b b b* will be violently agitated and driven about, and parts of it raised with the spiral current, and thrown about so as to form a bush-like appearance.

This circle is of various diameters, sometimes very large.

If the vacuum passes over water, the water may rise in it, in a body or column, to near the height of thirty-two feet.

If it passes over houses, it may burst their windows or walls outwards, pluck off the roofs, and pluck up the floors, by the sudden rarefaction of the air contained within such buildings; the outward pressure of the atmosphere being suddenly taken off. So the stopped bottle of air bursts under the exhausted receiver of the air-pump.

Figure 2 is to represent the elevation of a water-spout, wherein I suppose $P P P$ to be the cone, at first a vacuum, till $W W$, the rising column of water, has filled so much of it; $S S S S$, the spiral whirl of air, surrounding the vacuum, and continued higher in a close column after the vacuum ends in the point P , till it reaches the cool region of the air. $B B$, the bush, described by Stuart, surrounding the foot of the column of water.

Now, I suppose, this whirl of air will, at first, be as invisible as the air itself, though reaching in reality from the water to the region of cool air, in which our low summer thunder-clouds commonly float; but presently it will become visible at its extremities. *At its lower end*, by the agitation of the water under the whirling part of the circle, between P and S , forming Stuart's bush, and by the swelling and rising of the water in the beginning vacuum, which is at first a small, low, broad cone, whose top gradually rises

and sharpens as the force of the whirl increases. *At its upper end* it becomes visible, by the warm air brought up to the cooler region, where its moisture begins to be condensed into thick vapor by the cold, and is seen first at *A*, the highest part, which, being now cooled, condenses what rises next at *B*, which condenses that at *C*, and that condenses what is rising at *D*, the cold operating by the contact of the vapors faster in a right line downwards than the vapors themselves can climb in a spiral line upwards; they climb, however, and, as by continual addition they grow denser, and consequently their centrifugal force greater, and being risen above the concentrating currents that compose the whirl, fly off, spread, and form a cloud.

It seems easy to conceive how, by this successive condensation from above, the spout appears to drop or descend from the cloud, though the materials of which it is composed are all the while ascending.

The condensation of the moisture contained in so great a quantity of warm air as may be supposed to rise in a short time in this prodigiously rapid whirl, is, perhaps, sufficient to form a great extent of cloud, though the spout should be over land, as those at Hatfield; and if the land happens not to be very dusty, perhaps the lower part of the spout will scarce become visible at all, though the upper, or what is commonly called the descending, part be very distinctly seen.

The same may happen at sea, in case the whirl is not violent enough to make a high vacuum, and

raise the column, &c. In such case, the upper part *A B C D* only will be visible, and the bush perhaps below.

But if the whirl be strong, and there be much dust on the land, and the column *W W* be raised from the water, then the lower part becomes visible, and sometimes even united to the upper part. For the dust may be carried up in the spiral whirl, till it reach the region where the vapor is condensed, and rise with that even to the clouds ; and the friction of the whirling air, on the sides of the column *W W*, may detach great quantities of its water, break it into drops, and carry them up in the spiral whirl, mixed with the air ; the heavier drops may indeed fly off, and fall in a shower, round the spout ; but much of it will be broken into vapor, yet visible ; and thus, in both cases, by dust at land, and by water at sea, the whole tube may be darkened and rendered visible.

As the whirl weakens, the tube may (in appearance) separate in the middle, the column of water subsiding, and the superior condensed part drawing up to the cloud. Yet still the tube or whirl of air may remain entire, the middle only becoming invisible, as not containing visible matter.

Dr. Stuart says : “ It was observable of all the spouts he saw, but more perceptible of the great one, that towards the end it began to appear like a hollow canal, only black in the borders but white in the middle ; and though at first it was altogether black and opake, yet now one could very distinctly perceive

the sea water to fly up along the middle of this canal, as smoke up a chimney."

And Dr. Mather, describing a whirlwind, says : "A thick, dark, small cloud arose, with a pillar of light in it, of about eight or ten feet diameter, and passed along the ground in a tract not wider than a street, horribly tearing up trees by the roots, blowing them up in the air like feathers, and throwing up stones of great weight to a considerable height in the air," &c.

These accounts, the one of water-spouts, the other of a whirlwind, seem in this particular to agree ; what one gentleman describes as a tube, black in the borders and white in the middle, the other calls a black cloud with a pillar of light in it ; the latter expression has only a little more of the *marvellous*, but the thing is the same ; and it seems not very difficult to understand. When Dr. Stuart's spouts were full charged—that is, when the whirling pipe of air was filled between *a a a a* and *b b b b*, Figure 1, with quantities of drops, and vapor torn off from the column *W W*, Figure 2, the whole was rendered so dark as that it could not be seen through, nor the spiral ascending motion discovered ; but when the quantity ascending lessened, the pipe became more transparent, and the ascending motion visible. For, by inspection of the figure (Fig. 3) representing a section of our spout, with the vacuum in the middle, it is plain that if we look at such a hollow pipe in the direction of the arrows, and suppose opaque particles to be equally mixed in the space between the two circular lines,

both the part between the arrows *a* and *b* and that between the arrows *c* and *d* will appear much darker than that between *b* and *c*, as there must be many more of those opaque particles in the line of vision across the sides than across the middle. It is thus, that a hair in a microscope evidently appears to be a pipe, the sides showing darker than the middle. Dr. Mather's whirl was probably filled with dust, the sides were very dark, but the vacuum within rendering the middle more transparent, he calls it a pillar of light.

It was in this more transparent part between *b* and *c* that Stuart could see the spiral motion of the vapors, whose lines on the nearest and farthest side of the transparent part crossing each other, represented smoke ascending in a chimney; for, the quantity being still too great in the line of sight through the sides of the tube, the motion could not be discovered there, and so they represented the solid sides of the chimney.

When the vapors reach in the pipe from the clouds near to the earth, it is no wonder now to those who understand electricity, that flashes of lightning should descend by the spout, as in that of Rome.

But you object: If water may be thus carried into the clouds, why have we not salt rains? The objection is strong and reasonable, and I know not whether I can answer it to your satisfaction. I never heard but of one salt rain, and that was where a spout passed pretty near a ship; so I suppose it to be only the drops thrown off from the spout by the centrifugal force (as the birds were at Hatfield), when they had

been carried so high as to be above, or to be too strongly centrifugal for the pressure of the concurring winds surrounding it. And indeed I believe there can be no other kind of salt rain ; for it has pleased the goodness of God so to order it, that the particles of air will not attract the particles of salt, though they strongly attract water.

Hence, though all metals, even gold, may be united with air, and rendered volatile, salt remains fixed in the fire, and no heat can force it up to any considerable height, or oblige the air to hold it. Hence, when salt rises, as it will a little way, into air with water, there is instantly a separation made ; the particles of water adhere to the air, and the particles of salt fall down again, as if repelled and forced off from the water by some power in the air ; or as some metals, dissolved in a proper menstruum, will quit the solvent when other matter approaches, and adhere to that, so the water quits the salt and embraces the air ; but air will not embrace the salt and quit the water, otherwise our rains would indeed be salt, and every tree and plant on the face of the earth be destroyed, with all the animals that depend on them for subsistence. He who hath proportioned and given proper qualities to all things, was not unmindful of this. Let us adore HIM with praise and thanksgiving !

By some accounts of seamen, it seems the column of water, *W W*, sometimes falls suddenly ; and if it be, as some say, fifteen or twenty yards diameter, it must fall with great force, and they may well fear for

their ships. By one account, in the *Transactions*, of a spout that fell at Colne, in Lancashire, one would think the column is sometimes lifted off from the water and carried over land, and there let fall in a body; but this, I suppose, happens rarely.

Stuart describes his spouts as appearing no bigger than a mast, and sometimes less; but they were seen at a league and a half distance.

I think I formerly read in Dampier, or some other voyager, that a spout, in its progressive motion, went over a ship becalmed on the coast of Guinea, and first threw her down on one side, carrying away her foremast, then suddenly whipped her up and threw her down on the other side, carrying away her mizenmast, and the whole was over in an instant. I suppose the first mischief was done by the fore side of the whirl, the latter by the hinder side, their motion being contrary.

I suppose a whirlwind, or spout, may be stationary, when the concurring winds are equal; but if unequal, the whirl acquires a progressive motion, in the direction of the strongest pressure.

When the wind that gives the progressive motion becomes stronger below than above, or above than below, the spout will be bent, and, the cause ceasing, straighten again.

Your queries, towards the end of your paper, appear judicious and worth considering. At present I am not furnished with facts sufficient to make any pertinent answer to them; and this paper has already a sufficient quantity of conjecture.

Your manner of accommodating the accounts to your hypothesis of descending spouts is, I own, ingenious, and perhaps that hypothesis may be true. I will consider it farther ; but as yet I am not satisfied with it, though hereafter I may be.

Here you have my method of accounting for the principal phenomena, which I submit to your candid examination.

And as I now seem to have almost written a book instead of a letter, you will think it high time I should conclude, which I beg leave to do, with assuring you that I am, Sir, &c.

B. FRANKLIN.

XCVI.

TO JAMES BOWDOIN.

PHILADELPHIA, 28 February, 1753.

DEAR SIR :—The enclosed is a copy of a letter and some papers I received lately from a friend, of which I have struck off fifty copies by the press to distribute among my ingenious acquaintance in North America, hoping some of them will make the observations proposed. The improvement of geography and astronomy is the common concern of all polite nations, and I trust our country will not miss the opportunity of sharing in the honor to be got on this occasion. The French originals are despatched by express overland to Quebec. I doubt not but you will do what may lie in your power to promote the making these observations in New England, and that we may

not be excelled by the American French either in diligence or accuracy. We have here a three-foot reflecting telescope and other proper instruments, and intend to observe at our Academy, if the weather permit. You will see by our Almanac that we have had this transit under consideration before the arrival of these French letters.¹

Dr. Colden's book was printed in England last summer, but not to be published till the meeting of Parliament. I have one copy, however, which I purpose shortly to send you.

With great esteem and respect, I am, Sir,

Your most humble servant,

B. FRANKLIN.

XCVII.

TO JARED ELIOT.

PHILADELPHIA, 12 April, 1753.

DEAR SIR :—I received your favor of March 26th, and thank you for communicating to me the very ingenious letter from your friend, Mr. Todd, with whom, if it may be agreeable to him, I would gladly entertain a correspondence. I shall consider his objections till next post.

I thank you for your hint concerning the word *adhesion*, which should be defined. When I speak of particles of water *adhering* to particles of air, I mean not a firm adhesion, but a loose one, like that of a

¹ The paper alluded to, of which fifty copies were struck off for distribution, was entitled: "Letters

relating to a Transit of Mercury over the Sun, which is to happen May 6, 1753."

drop of water to the end of an icicle before freezing. The firm adhesion is after it is frozen.

I conceive that the original constituent particles of water are perfectly *hard, round, and smooth*. If so, there must be interstices, and yet the mass incompressible. A box filled with small shot has many interstices, and the shot may be compressed, because they are not perfectly hard. If they were, the interstices would remain the same, notwithstanding the greatest pressure, and would admit sand, as water admits salt.

Our vessel, named the *Argo*, is gone for the north-west passage ; and the captain has borrowed my Journals of the last voyage, except one volume of a broken set, which I send you. I enclose a letter from our friend, Mr. Collinson, and am promised some speltz, which I shall send per next post.

The *Tatler* tells us of a girl who was observed to grow suddenly proud, and none could guess the reason, till it came to be known that she had got on a pair of new silk garters. Lest you should be puzzled to guess the cause, when you observe any thing of the kind in me, I think I will not hide my new garters under my petticoats, but take the freedom to show them to you, in a paragraph of our friend Collinson's last letter, viz.—But I ought to mortify, and not indulge, this vanity ; I will not transcribe the paragraph, yet I cannot forbear.

“ If any of thy friends,” says Peter, “ should take notice that thy head is held a little higher up than formerly, let them know : when the grand monarch of France strictly commands the Abbé Mazéas to

write a letter in the politest terms to the Royal Society, to return the King's thanks and compliments in an express manner to Mr. Franklin of Pennsylvania, for his useful discoveries in electricity, and application of the pointed rods to prevent the terrible effects of thunder-storms, I say, after all this, is not some allowance to be made, if thy crest is a little elevated? There are four letters containing very curious experiments on thy doctrine of points and its verification, which will be printed in the new Transactions. I think, now I have stuck a feather in thy cap, I may be allowed to conclude in wishing thee long to wear it. Thine, P. COLLINSON."

On reconsidering this paragraph, I fear I have not so much reason to be proud as the girl had; for a feather in the cap is not so useful a thing, or so serviceable to the wearer, as a pair of good silk garters. The pride of man is very differently gratified; and had his Majesty sent me a marshal's staff, I think I should scarce have been so proud of it as I am of your esteem, and of subscribing myself, with sincerity, dear Sir,

Your affectionate friend and humble servant,

B. FRANKLIN.

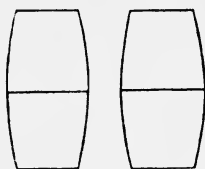
XCVIII.

TO JAMES BOWDOIN.

PHILADELPHIA, 12 April, 1753.

SIR :—I have shipped eighteen glass jars in casks well packed, on board Captain Branscombe for Boston; six of them are for you, the rest I understand

are for the College. Leaf tin, such as they use in silvering looking-glasses, is best to coat them with ; they should be coated to within about four or five inches of the brim. Cut the tin into pieces of the form here represented, and they will comply better with the bellying of the glass ; one piece only should be round to cover the bottom ; the same shapes will serve the inside. I had not conveniency to coat them for you, and feared to trust anybody else, Mr. Kinnersley being abroad in the West Indies. To make the pieces comply the better, they may be cut in two where the cross lines are. They reach from the top to the edge of the round piece which covers the bottom. I place them in loose rims of scabboard, something like a small sieve, in which they stand very well. If you charge more than one or two together, pray take care how you expose your head to an accidental stroke ; for, I can assure you from experience, one is sufficient to knock a stout man down ; and I believe a stroke from two or three, in the head, would kill him.



Has Dr. Colden's new book reached you in Boston ? If not, I will send it to you.

With great respect, I am, Sir,

Your most humble servant,

B. FRANKLIN.

P. S.—The glass-maker being from home, I cannot now get the account. The tin is laid on with common paste, made of flour and water boiled together, and the pieces may lap over each other a little.

XCIX.

TO WILLIAM SMITH.¹

PHILADELPHIA, 19 April, 1753.

SIR:—I received your favor of the 11th instant, with your new piece on *Education*,² which I shall carefully peruse, and give you my sentiments of it, as you desire, by next post.

I believe the young gentlemen, your pupils, may be entertained and instructed here in mathematics and philosophy to satisfaction. Mr. Alison,³ who was educated at Glasgow, has been long accustomed to teach the latter, and Mr. Grew⁴ the former, and I think their pupils make great progress. Mr. Alison has the care of the Latin and Greek school; but as he has now three good assistants,⁵ he can very well afford some hours every day for the instruction of those who are engaged in higher studies. The mathematical school is pretty well furnished with instruments. The English Library is a good one, and

¹ As early as 1743, Franklin had endeavored to procure the establishment of an Academy in Philadelphia. His efforts were not successful till 1749, when, chiefly through his instrumentality, the Academy was instituted and went into operation. Franklin was chosen the first president of the Board of Trustees. From this institution arose, first the College of Philadelphia, and afterwards the present University of Pennsylvania. The Reverend William Smith was appointed Provost of the Academy in 1754, and he filled that office, at the head of the Academy and College successively, for the period of thirty-seven years, till the University was founded in 1791. A full ac-

count of these institutions, in their various stages, may be seen in Wood's "History of the University of Pennsylvania," contained in the third volume of the "Memoirs of the Historical Society of Pennsylvania."

² A General Idea of the College of Mirania.—STUBER.

³ The Rev. Francis Alison, afterwards Vice-Provost of the College in Philadelphia.—STUBER.

⁴ Theophilus Grew, afterwards Professor of Mathematics in the College.—STUBER.

⁵ Those assistants were at that time Charles Thomson, afterwards Secretary of Congress, Paul Jackson, and Jacob Duché.—STUBER.

we have, belonging to it, a middling apparatus for experimental philosophy, and purpose speedily to complete it. The Loganian Library, one of the best collections in America, will shortly be opened ; so that neither books nor instruments will be wanting ; and as we are determined always to give good salaries, we have reason to believe we may have always an opportunity of choosing good masters ; upon which, indeed, the success of the whole depends. We are obliged to you for your kind offers in this respect, and when you are settled in England we may occasionally make use of your friendship and judgment.

If it suits your convenience to visit Philadelphia before your return to Europe, I shall be extremely glad to see and converse with you here, as well as to correspond with you after your settlement in England. For an acquaintance and communication with men of learning, virtue, and public spirit is one of my greatest enjoyments.

I do not know whether you ever happened to see the first proposals I made for erecting this Academy. I send them enclosed. They had, however imperfect, the desired success, being followed by a subscription of *four thousand pounds* towards carrying them into execution. And as we are fond of receiving advice, and are daily improving by experience, I am in hopes we shall, in a few years, see a *perfect institution*. I am, very respectfully, &c.,

B. FRANKLIN.

C.

TO WILLIAM SMITH.

PHILADELPHIA, 3 May, 1753.

SIR :—Mr. Peters has just now been with me, and we have compared notes on your new piece. We find nothing in the scheme of education, however excellent, but what is, in our opinion, very practicable. The great difficulty will be to find the Aratus¹ and other suitable persons to carry it into execution ; but such may be had if proper encouragement be given. We have both received great pleasure in the perusal of it. For my part, I know not when I have read a piece that has more affected me ; so noble and just are the sentiments, so warm and animated the language, yet, as censure from your friends may be of more use, as well as more agreeable, to you than praise, I ought to mention that I wish you had omitted, not only the quotation from the Review,² which you are now justly dissatisfied with, but those expressions of resentment against your adversaries, in pages 65 and 79. In such cases, the noblest victory is obtained by neglect and by shining on.

Mr. Allen has been out of town these ten days, but before he went he directed me to procure him six copies of your piece. Mr. Peters has taken ten. He purposed to have written to you, but omits it, as he

¹ The name given to the principal or head of the ideal college, the system of education in which has nevertheless been nearly realized, or followed as a model, in the College and Academy of Philadelphia and some other American seminaries for many years past.—STUBER.

² The quotation alluded to (from the *London Monthly Review* for 1749) was judged to reflect too severely on the discipline and government of the English Universities of Oxford and Cambridge, and was expunged from the following editions of this work.—STUBER.

expects so soon to have the pleasure of seeing you here. He desires me to present his affectionate compliments to you, and to assure you that you will be very welcome to him. I shall only say that you may depend on my doing all in my power to make your visit to Philadelphia agreeable to you. I am, &c.,

B. FRANKLIN.

CI.

TO PETER COLLINSON.

PHILADELPHIA, 9 May, 1753.

SIR:—I thank you for the kind and judicious remarks you have made on my little piece. I have often observed with wonder that temper of the poorer English laborers which you mention, and acknowledge it to be pretty general. When any of them happen to come here, where labor is much better paid than in England, their industry seems to diminish in equal proportion. But it is not so with the German laborers; they retain the habitual industry and frugality they bring with them, and receiving higher wages, an accumulation arises that makes them all rich. When I consider that the English are the offspring of Germans; that the climate they live in is much of the same temperature, and when I see nothing in nature that should create this difference, I am tempted to suspect it must arise from the constitution; and I have sometimes doubted whether the laws peculiar to England, which *compel the rich to maintain the poor*, have not given the latter a dependence that very

much lessens the care of providing against the wants of old age.

I have heard it remarked that the poor in Protestant countries, on the continent of Europe, are generally more industrious than those of Popish countries. May not the more numerous foundations in the latter for relief of the poor have some effect towards rendering them less provident? To relieve the misfortunes of our fellow creatures is concurring with the Deity; it is godlike; but if we provide encouragement for laziness, and support for folly, may we not be found fighting against the order of God and nature, which perhaps has appointed want and misery as the proper punishments for, and cautions against, as well as necessary consequences of, idleness and extravagance? Whenever we attempt to amend the scheme of Providence, and to interfere with the government of the world, we had need be very circumspect, lest we do more harm than good. In New England they once thought blackbirds useless, and mischievous to the corn. They made efforts to destroy them. The consequence was, the blackbirds were diminished; but a kind of worm, which devoured their grass, and which the blackbirds used to feed on, increased prodigiously; then, finding their loss in grass much greater than their saving in corn, they wished again for their blackbirds.

We had here some years since a Transylvanian Tartar, who had travelled much in the East, and came hither merely to see the West, intending to go home through the Spanish West Indies, China,

&c. He asked me one day, what I thought might be the reason that so many and such numerous nations, as the Tartars in Europe and Asia, the Indians in America, and the Negroes in Africa, continued a wandering, careless life, and refused to live in cities, and cultivate the arts they saw practised by the civilized parts of mankind? While I was considering what answer to make him he said, in his broken English: "God make man for Paradise. He make him for live lazy. Man make God angry. God turn him out of Paradise, and bid workee. Man no love workee; he want to go to Paradise again; he want to live lazy. So all mankind love lazy." However this may be, it seems certain that the hope of becoming at some time of life free from the necessity of care and labor, together with fear of penury, are the main springs of most people's industry. To those, indeed, who have been educated in elegant plenty, even the provision made for the poor may appear misery; but to those who have scarce ever been better provided for, such provision may seem quite good and sufficient. These latter, then, have nothing to fear worse than their present condition, and scarce hope for any thing better than a parish maintenance. So that there is only the difficulty of getting that maintenance allowed while they are able to work, or a little shame they suppose attending it, that can induce them to work at all; and what they do will only be from hand to mouth.

The proneness of human nature to a life of ease, of freedom from care and labor, appears strongly in

the little success that has hitherto attended every attempt to civilize our American Indians. In their present way of living, almost all their wants are supplied by the spontaneous productions of nature, with the addition of very little labor, if hunting and fishing may indeed be called labor, where game is so plenty. They visit us frequently, and see the advantages that arts, sciences, and compact societies procure us. They are not deficient in natural understanding; and yet they have never shown any inclination to change their manner of life for ours, or to learn any of our arts. When an Indian child has been brought up among us, taught our language, and habituated to our customs, yet if he goes to see his relatives, and makes one Indian ramble with them, there is no persuading him ever to return. And that this is not natural to them merely as Indians, but as men, is plain from this, that when white persons, of either sex, have been taken prisoners by the Indians, and lived awhile with them, though ransomed by their friends, and treated with all imaginable tenderness to prevail with them to stay among the English, yet in a short time they become disgusted with our manner of life, and the care and pains that are necessary to support it, and take the first opportunity of escaping again into the woods, from whence there is no redeeming them. One instance I remember to have heard, where the person was brought home to possess a good estate; but, finding some care necessary to keep it together, he relinquished it to a younger brother, reserving to

himself nothing but a gun and a match-coat, with which he took his way again into the wilderness.

So that I am apt to imagine that close societies, subsisting by labor and art, arose first not from choice but from necessity, when numbers being driven by war from their hunting grounds, and prevented by seas, or by other nations, from obtaining other hunting grounds, were crowded together into some narrow territories, which without labor could not afford them food. However, as matters now stand with us, care and industry seem absolutely necessary to our well-being. They should therefore have every encouragement we can invent, and not one motive to diligence be subtracted; and the support of the poor should not be by maintaining them in idleness, but by employing them in some kind of labor suited to their abilities of body, as I am informed begins to be of late the practice in many parts of England, where work-houses are erected for that purpose. If these were general, I should think the poor would be more careful, and work voluntarily to lay up something for themselves against a rainy day, rather than run the risk of being obliged to work at the pleasure of others for a bare subsistence, and that too under confinement.

The little value Indians set on what we prize so highly, under the name of learning, appears from a pleasant passage that happened some years since, at a treaty between some colonies and the Six Nations. When every thing had been settled to the satisfaction of both sides, and nothing remained but a mutual exchange of civilities, the English Commissioners told

the Indians that they had in their country a college for the instruction of youth, who were there taught various languages, arts, and sciences ; that there was a particular foundation in favor of the Indians to defray the expense of the education of any of their sons who should desire to take the benefit of it ; and said, if the Indians would accept the offer, the English would take half a dozen of their brightest lads, and bring them up in the best manner. The Indians, after consulting on the proposals, replied, that it was remembered that some of their youths had formerly been educated at that college, but that it had been observed that for a long time after they returned to their friends *they were absolutely good for nothing* ; being neither acquainted with the true method of killing deer, catching beavers, or surprising an enemy. The proposition they looked on, however, as a mark of kindness and good will of the English to the Indian nations, which merited a grateful return ; and therefore, if the English gentlemen would send a dozen or two of their children to Onondaga, the Great Council would take care of their education, bring them up in what was really the best manner, and make men of them.

I am perfectly of your mind, that measures of great temper are necessary with the Germans ; and am not without apprehensions, that, through their indiscretion, or ours, or both, great disorders may one day arise among us. Those who come hither are generally the most stupid of their own nation, and, as ignorance is often attended with credulity when knavery would mislead it, and with suspicion when

honesty would set it right ; and as few of the English understand the German language, and so cannot address them either from the press or the pulpit, it is almost impossible to remove any prejudices they may entertain. Their clergy have very little influence on the people, who seem to take a pleasure in abusing and discharging the minister on every trivial occasion. Not being used to liberty, they know not how to make a modest use of it. And as Kolben says of the young Hottentots, that they are not esteemed men until they have shown their manhood by *beating their mothers*, so these seem not to think themselves free, till they can feel their liberty in abusing and insulting their teachers. Thus they are under no restraint from ecclesiastical government ; they behave, however, submissively enough at present to the civil government, which I wish they may continue to do, for I remember when they modestly declined intermeddling in our elections, but now they come in droves and carry all before them, except in one or two counties.

Few of their children in the country know English. They import many books from Germany ; and of the six printing-houses in the province, two are entirely German, two half German half English, and but two entirely English. They have one German newspaper, and one half-German. Advertisements, intended to be general, are now printed in Dutch and English. The signs in our streets have inscriptions in both languages, and in some places only German. They begin of late to make all their bonds and other legal

instruments in their own language, which (though I think it ought not to be) are allowed good in our courts, where the German business so increases that there is continued need of interpreters ; and I suppose in a few years they will also be necessary in the Assembly, to tell one half of our legislators what the other half say.

In short, unless the stream of their importation could be turned from this to other colonies, as you very judiciously propose, they will soon so outnumber us that all the advantages we have will, in my opinion, be not able to preserve our language, and even our government will become precarious. The French, who watch all advantages, are now themselves making a German settlement, back of us, in the Illinois country, and by means of these Germans they may in time come to an understanding with ours ; and, indeed, in the last war, our Germans showed a general disposition, that seemed to bode us no good. For, when the English, who were not Quakers, alarmed by the danger arising from the defenceless state of our country, entered unanimously into an association, and within this government and the Lower Counties raised, armed, and disciplined near ten thousand men, the Germans, except a very few in proportion to their number, refused to engage in it, giving out, one amongst another, and even in print, that, if they were quiet, the French, should they take the country, would not molest them ; at the same time abusing the Philadelphians for fitting out privateers against the enemy, and representing the

trouble, hazard, and expense of defending the province, as a greater inconvenience than any that might be expected from a change of government. Yet I am not for refusing to admit them entirely into our colonies. All that seems to me necessary is, to distribute them more equally, mix them with the English, establish English schools where they are now too thick settled, and take some care to prevent the practice, lately fallen into by some of the ship-owners, of sweeping the German gaoles to make up the number of their passengers. I say I am not against the admission of Germans in general, for they have their virtues. Their industry and frugality are exemplary. They are excellent husbandmen, and contribute greatly to the improvement of a country.

I pray God to preserve long to Great Britain the English laws, manners, liberties, and religion. Notwithstanding the complaints so frequent in your public papers, of the prevailing corruption and degeneracy of the people, I know you have a great deal of virtue still subsisting among you; and I hope the constitution is not so near a dissolution as some seem to apprehend. I do not think you are generally become such slaves to your vices, as to draw down the *justice* Milton speaks of, when he says, that—¹

¹ This letter was first printed in the *Gentleman's Magazine* for January, 1834, as contained in the Diary of Mr. Thomas Green. The person who communicated it to the *Magazine* says the original manuscript, from which he transcribed the letter, ends thus abruptly, and that the remainder could not be recovered. He con-

jectures that the words of Milton, alluded to by the writer are the following:

"Yet sometimes nations will decline so low
From virtue, which is reason, that no
wrong
But justice, and some fatal curse annex'd,
Deprives them of their outward liberty,
Their inward lust."

—*Paradise Lost*, xii., 97.

CII.

TO PETER COLLINSON.

THE SEA AND LIGHTNING.

PHILADELPHIA, — September, 1753.

SIR :—In my former paper on this subject, written first in 1747, enlarged and sent to England in 1749, I considered the sea as the grand source of lightning, imagining its luminous appearance to be owing to electric fire, produced by friction between the particles of water and those of salt.

Living far from the sea, I had then no opportunity of making experiments on the sea water, and so embraced this opinion too hastily. For, in 1750 and 1751, being occasionally on the seacoast, I found, by experiments, that sea water in a bottle, though at first it would by agitation appear luminous, yet in a few hours it lost that virtue; *hence and from this*, that I could not by agitating a solution of sea salt in water produce any light, I first began to doubt of my former hypothesis, and to suspect that the luminous appearance in sea water must be owing to some other principles.

I then considered whether it were not possible that the particles of air, being *electrics per se*, might, in hard gales of wind, by their friction against trees, hills, buildings, &c., as so many minute electric globes, rubbing against non-electric cushions, draw the electric fire from the earth, and that the rising vapors might receive that power from the air, and by such means the clouds become electrified.

If this were so, I imagined that by forcing a constant violent stream of air against my prime conductor, by bellows, I should electrify it *negatively*; the rubbing particles of air drawing from it part of its natural quantity of the electric fluid. I accordingly made the experiment, but it did not succeed.

In September, 1752, I erected an iron rod to draw the lightning down into my house, in order to make some experiments on it, with two bells to give notice when the rod should be electrified; a contrivance obvious to every electrician.

I found the bells rang sometimes when there was no lightning or thunder, but only a dark cloud over the rod; that sometimes, after a flash of lightning, they would suddenly stop; and, at other times, when they had not rung before, they would, after a flash, suddenly begin to ring; that the electricity was sometimes very faint, so that, when a small spark was obtained, another could not be got for some time after; at other times the sparks would follow extremely quick, and once I had a continual stream from bell to bell, the size of a crow-quill; even during the same gust there were considerable variations.

In the winter following I conceived an experiment, to try whether the clouds were electrified *positively* or *negatively*; but my pointed rod, with its apparatus, becoming out of order, I did not refit it till towards the spring, when I expected the warm weather would bring on more frequent thunder-clouds.

The experiment was this: to take two phials; charge one of them with lightning from the iron rod, and

give the other an equal charge by the electric glass globe, through the prime conductor; when charged, to place them on a table within three or four inches of each other, a small cork ball being suspended by a fine silk thread from the ceiling so as it might play between the wires. If both bottles then were electrified *positively*, the ball, being attracted and repelled by one, must be also repelled by the other. If the one *positively*, and the other *negatively*, then the ball would be attracted and repelled alternately by each, and continue to play between them as long as any considerable charge remained.

Being very intent on making this experiment, it was no small mortification to me that I happened to be abroad during two of the greatest thunder-storms we had early in the spring; and though I had given orders in the family that if the bells rang when I was from home they should catch some of the lightning for me in electrical phials, and they did so, yet it was mostly dissipated before my return; and in some of the other gusts, the quantity of lightning I was able to obtain was so small, and the charge so weak, that I could not satisfy myself; yet I sometimes saw what heightened my suspicions and inflamed my curiosity.

At last, on the 12th of April, 1753, there being a smart gust of some continuance, I charged one phial pretty well with lightning, and the other equally, as near as I could judge, with electricity from my glass globe; and, having placed them properly, I beheld, with great surprise and pleasure, the cork ball play

briskly between them, and was convinced that one bottle was electrized *negatively*.

I repeated this experiment several times during the gust, and in eight succeeding gusts, always with the same success ; and being of opinion (for reasons I formerly gave in my letter to Mr. Kinnersley, since printed in London), that the glass globe electrizes *positively*, I concluded that the clouds are *always* electrized *negatively*, or have always in them less than their natural quantity of the electric fluid.

Yet, notwithstanding so many experiments, it seems I concluded too soon ; for at last, June the 6th, in a gust which continued from five o'clock P.M., to seven, I met with one cloud that was electrized *positively*, though several that passed over my rod before, during the same gust, were in the *negative* state. This was thus discovered.

I had another concurring experiment, which I often repeated, to prove the negative state of the clouds, viz., while the bells were ringing, I took the phial, charged from the glass globe, and applied its wire to the erected rod, considering that if the clouds were electrized *positively*, the rod, which received its electricity from them, must be so too ; and then the additional *positive* electricity of the phial would make the bells ring faster ; but if the clouds were in a *negative* state, they must exhaust the electric fluid from my rod, and bring that into the same negative state with themselves, and then the wire of a positively charged phial, supplying the rod with what it wanted (which it was obliged otherwise to draw from the earth by

means of the pendulous brass ball playing between the two bells), the ringing would cease till the bottle was discharged.

In this manner I quite discharged into the rod several phials, that were charged from the glass globe, the electric fluid streaming from the wire to the rod, till the wire would receive no spark from the finger; and during this supply to the rod from the phial, the bells stopped ringing; but by continuing the application of the phial wire to the rod, I exhausted the natural quantity from the inside surface of the same phials, or, as I call it, charged them *negatively*.

At length, while I was charging a phial by my glass globe, to repeat the experiment, my bells of themselves stopped ringing, and, after some pause, began to ring again. But now, when I approached the wire of the charged phial to the rod, instead of the usual stream that I expected from the wire to the rod, there was no spark—not even when I brought the wire and the rod to touch; yet the bells continued ringing vigorously, which proved to me that the rod was then *positively* electrified, as well as the wire of the phial, and equally so; and, consequently, that the particular cloud then over the rod was in the same positive state. This was near the end of the gust.

But this was a single experiment, which, however, destroys my first too general conclusion, and reduces me to this: *That the clouds of a thunder-gust are most commonly in a negative state of electricity, but sometimes in a positive state.*

The latter I believe is rare ; for, though I, soon after the last experiment, set out on a journey to Boston, and was from home most part of the summer, which prevented my making further trials and observations, yet Mr. Kinnersley, returning from the Islands just as I left home, pursued the experiments during my absence, and informs me that he always found the clouds in the *negative* state.

So that, for the most, part in thunder-strokes, *it is the earth that strikes into the clouds, and not the clouds that strike into the earth.*

Those who are versed in electric experiments will easily conceive that the effects and appearances must be nearly the same in either case : the same explosion and the same flash between one cloud and another, and between the clouds and mountains, &c.; the same rending of trees, walls, &c., which the electric fluid meets with in its passage ; and the same fatal shock to animal bodies ; and that pointed rods fixed on buildings or masts of ships, and communicating with the earth or sea, must be of the same service in restoring the equilibrium silently between the earth and clouds, or in conducting a flash or stroke, if one should be, so as to save harmless the house or vessel ; for points have equal power to throw off, as to draw on, the electric fire, and rods will conduct up as well as down.

But though the light gained from these experiments makes no alteration in the practice, it makes a considerable one in the theory. And now we as much need an hypothesis to explain by what means

the clouds become negatively, as before to show how they became positively, electrified.

I cannot forbear venturing some few conjectures on this occasion ; they are what occur to me at present, and though future discoveries should prove them not wholly right, yet they may in the meantime be of some use, by stirring up the curious to make more experiments, and occasion more exact disquisitions.

I conceive, then, that this globe of earth and water, with its plants, animals, and buildings, have, diffused throughout their substance, a quantity of the electric fluid, just as much as they can contain, which I call the *natural quantity*.

That this natural quantity is not the same in all kinds of common matter under the same dimensions, nor in the same kind of common matter in all circumstances ; but a solid foot, for instance, of one kind of common matter may contain more of the electric fluid than a solid foot of some other kind of common matter ; and a pound weight of the same kind of common matter may, when in a rarer state, contain more of the electric fluid than when in a denser state.

For the electric fluid being attracted by any portion of common matter, the parts of that fluid (which have among themselves a mutual repulsion) are brought so near to each other, by the attraction of the common matter that absorbs them, as that their repulsion is equal to the condensing power of attraction in common matter ; and then such portion of common matter will absorb no more.

Bodies of different kinds, having thus attracted and

absorbed what I call their *natural quantity*, that is, just as much of the electric fluid as is suited to their circumstances of density, rarity, and power of attracting, do not then show any signs of electricity among each other.

And if more electric fluid be added to one of these bodies, it does not enter, but spreads on the surface, forming an atmosphere; and then such body shows signs of electricity.

I have, in a former paper, compared common matter to a sponge, and the electric fluid to water; I beg leave once more to make use of the same comparison, to illustrate farther my meaning in this particular.

When a sponge is somewhat condensed by being squeezed between the fingers, it will not receive and retain so much water as when in its more loose and open state.

If *more* squeezed and condensed, some of the water will come out of its inner parts, and flow on the surface.

If the pressure of the fingers be entirely removed, the sponge will not only resume what was lately forced out, but attract an additional quantity.

As the sponge in its rarer state will *naturally* attract and absorb *more* water, and in its denser state will *naturally* attract and absorb *less* water, we may call the quantity it attracts and absorbs in either state its *natural quantity*, the state being considered.

Now what the sponge is to water, the same is water to the electric fluid.

When a portion of water is in its common dense

state, it can hold no more electric fluid than it has ; if any be added, it spreads on the surface.

When the same portion of water is rarefied into vapor, and forms a cloud, it is then capable of receiving and absorbing a much greater quantity ; there is room for each particle to have an electric atmosphere.

Thus water, in its rarefied state, or in the form of a cloud, will be in a negative state of electricity ; it will have less than its *natural quantity*—that is, less than it is naturally capable of attracting and absorbing in that state.

Such a cloud, then, coming so near the earth as to be within the striking distance, will receive from the earth a flash of the electric fluid, which flash, to supply a great extent of cloud, must sometimes contain a very great quantity of that fluid.

Or such a cloud, passing over woods of tall trees, may, from the points and sharp edges of their moist top leaves, receive silently some supply.

A cloud, being by any means supplied from the earth, may strike into other clouds that have not been supplied, or not so much supplied ; and those to others, till an equilibrium is produced among all the clouds that are within striking distance of each other.

The cloud thus supplied, having parted with much of what it first received, may require and receive a fresh supply from the earth, or from some other cloud which by the wind is brought into such a situation as to receive it more readily from the earth.

Hence repeated and continual strokes and flashes, till the clouds have all got nearly their natural quan-

tity as clouds, or till they have descended in showers, and are united again with this terraqueous globe, their original.

Thus thunder-clouds are generally in a negative state of electricity compared with the earth, agreeable to most of our experiments ; yet, as by one experiment we found a cloud electrized positively, I conjecture that in that case such cloud, after having received what was, in its rare state, only its *natural quantity*, became compressed by the driving winds, or some other means, so that part of what it had absorbed was forced out, and formed an electric atmosphere around it in its denser state. Hence it was capable of communicating positive electricity to my rod.

To show that a body in different circumstances of dilatation and contraction is capable of receiving and retaining more or less of the electric fluid on its surface, I would relate the following experiment : I placed a clean wine-glass on the floor, and on it a small silver can. In the can I put about three yards of brass chain ; to one end of which I fastened a silk thread, which went right up to the ceiling, where it passed over a pulley, and came down again to my hand, that I might at pleasure draw the chain up out of the can, extending it till within a foot of the ceiling, and let it gradually sink into the can again. From the ceiling, by another thread of fine raw silk, I suspended a small light lock of cotton, so as that when it hung perpendicularly it came in contact with the side of the can. Then, approaching the wire of a charged phial to the can, I gave it a spark which flowed round in an

electric atmosphere ; and the lock of cotton was repelled from the side of the can to the distance of about nine or ten inches. The can would not then receive another spark from the wire of the phial ; but as I gradually drew up the chain, the atmosphere of the can diminished by flowing over the rising chain, and the lock of cotton accordingly drew nearer and nearer to the can ; and then, if I again brought the phial wire near the can, it would receive another spark, and the cotton fly off again to its first distance ; and thus, as the chain was drawn higher, the can would receive more sparks ; because the can and extended chain were capable of supporting a greater atmosphere than the can with the chain gathered up into its belly. And that the atmosphere round the can was diminished by raising the chain, and increased again by lowering, is not only agreeable to reason, since the atmosphere of the chain must be drawn from that of the can, when it rose, and returned to it again when it fell ; but was also evident to the eye, the lock of cotton always approaching the can when the chain was drawn up, and receding when it was let down again.

Thus we see that increase of surface makes a body capable of receiving a greater electric atmosphere ; but this experiment does not, I own, fully demonstrate my new hypothesis ; for the brass and silver still continue in their solid state, and are not rarefied into vapor, as the water is in clouds. Perhaps some future experiments on vaporized water may set this matter in a clearer light.

One seemingly material objection arises to the new hypothesis, and it is this : if water in its rarefied state, as a cloud, requires and will absorb more of the electric fluid than when in its dense state as water, why does it not acquire from the earth all its wants at the instant of its leaving the surface, while it is yet near, and but just rising in vapor? To this difficulty I own I cannot at present give a solution satisfactory to myself. I thought, however, that I ought to state it in its full force, as I have done, and submit the whole to examination.

And I would beg leave to recommend it to the curious in this branch of natural philosophy, to repeat with care and accurate observation, the experiments I have reported in this and former papers relating to *positive* and *negative* electricity, with such other relative ones as shall occur to them, that it may be certainly known whether the electricity communicated by a glass globe be *really positive*. And also I would request all who may have the opportunity of observing the recent effects of lightning on buildings, trees, &c., that they would consider them particularly with a view to discover the direction. But in these examinations this one thing is always to be understood, viz., that a stream of the electric fluid passing through wood, brick, metal, &c., while such fluid passes in *small quantity*, the mutually repulsive power of its parts is confined and overcome by the cohesion of the parts of the body it passes through, so as to prevent an explosion ; but when the fluid comes in a quantity too great to be confined by such cohesion,

it explodes, and rends or fuses the body that endeavoured to confine it. If it be wood, brick, stone, or the like, the splinters will fly off on that side where there is least resistance. And thus, when a hole is struck through pasteboard by the electrified jar, if the surfaces of the pasteboard are not confined or compressed, there will be a bur raised all round the hole on both sides the pasteboard ; but if one side be confined, so that the bur cannot be raised on that side, it will be all raised on the other, which way soever the fluid was directed. For the bur round the outside of the hole is the effect of the explosion every way from the centre of the stream, and not an effect of the direction.

In every stroke of lightning, I am of opinion that the stream of the electric fluid, moving to restore the equilibrium between the cloud and the earth, does always previously find its passage, and mark out, as I may say, its own course, taking in its way all the conductors it can find, such as metals, damp walls, moist wood, &c., and will go considerably out of a direct course for the sake of the assistance of good conductors ; and that, in this course, it is actually moving, though silently and imperceptibly, before the explosion, in and among the conductors ; which explosion happens only when the conductors cannot discharge it as fast as they receive it, by reason of their being incomplete, disunited, too small, or not of the best materials for conducting. Metalline rods, therefore, of sufficient thickness, and extending from the highest part of an edifice to the ground, being of

the best materials and complete conductors, will, I think, secure the building from damage, either by restoring the equilibrium so fast as to prevent a stroke, or by conducting it in the substance of the rod as far as the rod goes, so that there shall be no explosion but what is above its point, between that and the clouds.

If it be asked, What thickness of a metalline rod may be supposed sufficient? in answer, I would remark that five large glass jars, such as I have described in my former papers, discharge a very great quantity of electricity, which, nevertheless, will be all conducted round the corner of a book, by the fine filleting of gold on the cover, it following the gold the farthest way about rather than take the shorter course through the cover, that not being so good a conductor. Now, in this line of gold, the metal is so extremely thin as to be little more than the color of gold, and on an octavo book is not in the whole an inch square, and, therefore, not the thirty-sixth part of a grain, according to M. Réaumur; yet it is sufficient to conduct the charge of five large jars, and how many more I know not. Now, I suppose a wire of a quarter of an inch diameter, to contain about five thousand times as much metal as there is in that gold line; and, if so, it will conduct the charge of twenty-five thousand such glass jars, which is a quantity, I imagine, far beyond what was ever contained in any one stroke of natural lightning. But a rod of half an inch diameter would conduct four times as much as one of a quarter.

And with regard to conducting, though a certain thickness of metal be required to conduct a great quantity of electricity, and at the same time keep its own substance firm and unseparated, and a less quantity, as a very small wire, for instance, will be destroyed by the explosion; yet such small wire will have answered the end of conducting that stroke, though it become incapable of conducting another. And, considering the extreme rapidity with which the electric fluid moves without exploding, when it has a free passage, or complete metal communication, I should think a vast quantity would be conducted in a short time, either to or from a cloud, to restore its equilibrium with the earth, by means of a very small wire, and, therefore, thick rods should seem not so necessary. However, as the quantity of lightning discharged in one stroke cannot well be measured, and in different strokes is certainly very various, in some much greater than in others; and as iron (the best metal for the purpose, being least apt to fuse) is cheap, it may be well enough to provide a larger canal to guide that impetuous blast than we imagine necessary; for, though one middling wire may be sufficient, two or three can do no harm. And time, with careful observations well compared, will at length point out the proper size to greater certainty.

Pointed rods erected on edifices may likewise often prevent a stroke in the following manner: An eye so situated as to view horizontally the under side of a thunder-cloud, will see it very ragged, with a number of separate fragments, or petty clouds, one under

another, the lowest sometimes not far from the earth. These, as so many stepping-stones, assist in conducting a stroke between the cloud and a building. To represent these by an experiment, take two or three locks of fine, loose cotton ; connect one of them with the prime conductor by a fine thread of two inches (which may be spun out of the same lock by the fingers), another to that, and the third to the second, by like threads. Turn the globe, and you will see these locks extend themselves towards the table (as the lower small clouds do towards the earth), being attracted by it ; but on presenting a sharp point erect under the lowest, it will shrink up to the second, the second to the first, and all together to the prime conductor, where they will continue as long as the point continues under them. May not, in like manner, the small electrized clouds, whose equilibrium with the earth is soon restored by the point, rise up to the main body, and by that means occasion so large a vacancy as that the grand cloud cannot strike in that place ?

These thoughts, my dear friend, are many of them crude and hasty ; and if I were merely ambitious of acquiring some reputation in philosophy, I ought to keep them by me till corrected and improved by time and farther experience. But since even short hints and imperfect experiments in any new branch of science, being communicated, have oftentimes a good effect in exciting the attention of the ingenious to the subject, and so become the occasion of more exact disquisition and more complete discoveries, you are

at liberty to communicate this paper to whom you please ; it being of more importance that knowledge should increase than that your friend should be thought an accurate philosopher.

B. FRANKLIN.

CIII.

TO JAMES BOWDOIN.

PHILADELPHIA, 18 October, 1753.

DEAR SIR :—I recollect that I promised to send you Dr. Brownrigg's *Treatise on Common Salt*. You will receive it herewith. I hope it may be of use in the affair of your fishery. Please to communicate it to Captain Erwin, Mr. Pitts, Mr. Boutineau, or any other of your friends who may be desirous of seeing it.

Since my return from Boston, I have been to our western frontiers on a treaty with the Ohio Indians. They complained much of the abuses they suffer from our traders, and earnestly requested us to put the trade under some regulation. If you can procure and send me your truckhouse law, and a particular account of the manner of executing it, with its consequences, &c., so that we may have the benefit of your experience, you will much oblige me ; and if you have found it a useful law, I am in hopes we shall be induced to follow your good example.¹

¹ Mr. Bowdoin replied as follows, in a letter dated at Boston, November 12th :—"Our Indians formerly (as yours now) made great complaints of the abuses they suffered from private traders, which induced the gov-

ernment to erect truckhouses for them ; where they have since been supplied with the goods they wanted in a much better manner both in regard of the quality and price of them, and with more certainty than the private traders

My compliments to Mrs. Bowdoin and all inquiring friends. With much respect and esteem, I am, dear Sir, &c.,

B. FRANKLIN.

CIV.

TO CADWALLADER COLDEN.

PHILADELPHIA, 25 October, 1753.

SIR :—This last summer I have enjoyed very little of the pleasure of reading or writing. I made a long journey to the eastward, which consumed ten weeks, and two journeys to our western frontier; one of them, to meet and hold a treaty with the Ohio Indians, in company with Mr. Peters and Mr. Norris.¹ I shall send you a copy of that treaty as soon as it is published. I should be glad to know whether the Act, mentioned in your *History of the Five Nations*,

could. The government used to put an advance on the goods supplied, but now they let the Indians have them in the small quantities they want at the same rate they are purchased here in the wholesale way, and allow them for their peltry what it sells for here; and, notwithstanding, they are frequently complaining about the prices of the exchanged commodities, and say that the French supply them at a cheaper rate, and allow them more for their skins than we do; but some allowance is to be made for this account of theirs.

“The best method we can go into, is to supply them with what they want at the cheapest rate possible, which will not only undermine the French trade with them, but in proportion thereto bring them into our interest and friendship against the French; for trade and commerce between nation and nation, especially when carried on to mutual advantage, have

a natural tendency to beget and confirm a mutual and lasting friendship. Another good effect of this method is, that it prevents the Indians from being concerned with private traders; for not being able to supply them at so low a rate as the government, the Indians will not trade with them, and it is therefore a more effectual bar against private trade than all the laws that can be invented.

“Our truckhouses are built in form of a square, each side one hundred and fifty feet or more, at each corner a flanker, in which is a couple of cannon; three sides of the square are built upon to accommodate the garrison and for storehouses, the whole being surrounded with palisades.”

¹ This treaty, or rather conference, was held at Carlisle, in Pennsylvania, with deputies from several tribes of western Indians. See Sparks' “Life of Washington,” 2d edition, p. 25.

to prevent the people of New York from supplying the French with Indian goods, still subsists, and is duly executed.¹

I left your book with Mr. Bowdoin, in Boston. I hope you will hear from him this winter. I observed extracts from it in all the Magazines, and in the *Monthly Review*, but I see no observations on it. I send you herewith Nollet's book. M. Dalibard writes me that he is just about to publish an answer to it, which, perhaps, may save me the trouble.

I hope soon to find time to finish my new Hypothesis of Thunder and Lightning, which I shall immediately communicate to you. I sent you, by our friend Bartram, some meteorological conjectures for your amusement. When perused, please to return them, as I have no copy. With sincere esteem and respect, I am, dear Sir, &c.,

B. FRANKLIN.

CV.

TO THOMAS CLAP.²

PHILADELPHIA, 8 November, 1753.

DEAR SIR :—The first intimation I find of the new air-pump is in a piece of Mr. Watson's read to the

¹ To this inquiry Mr. Colden replied, November 19th :—"We have at present no law in this province for restraining the trade to Canada, except that by which a duty is laid on Indian goods sold out of the city of Albany and applied for support of the garrison at Oswego. It is certain that a very considerable trade is carried on between Albany and Canada by means of the Caghnawaga or French Indians, all of them deserters from the Five Nations. When I was last at Albany,

there were at least two hundred of them, stout young fellows, at one time in the town. The Indians have passports from the governor of Canada, and I therefore conclude that this trade is thought beneficial to the French interest, and it may be a great inducement to our Indians to desert, by the benefit they receive from it; for none are allowed to be the carriers between Albany and Canada but French Indians."

² President of Yale College.

Royal Society, February 20th, 1752, where, describing some experiments he made *in vacuo*, he says : " The more complete the vacuum, *cæteris paribus*, the more considerable were the effects ; and here I should not do justice to real merit were I silent in regard to Mr. Smeaton. This gentleman, with a genius truly mechanical, which enables him to give to such philosophical instruments as he executes a degree of perfection scarce to be found elsewhere ; this gentleman, I say, has constructed an air-pump by which we are empowered to make Boyle's vacuum much more perfect than heretofore. By a well conducted experiment, which admits of no doubt as to its truth, I have seen by this pump the air rarefied to one thousand times its natural state ; whereas, commonly, we seldom arrive at above one hundred and fifty. As the promotion of the mechanic arts is a considerable object of our excellent institution, if this gentleman could be prevailed upon to communicate to the Royal Society that particular construction of his air-pump which enables it to execute so much more than those commonly in use, it would not fail to be an acceptable present."

So far Mr. Watson. In April following, was read a letter from Mr. Smeaton, in which he describes his improvement, and gives a draft of his pump ; the whole too long to transcribe ; but it appears to me that the machine, being rather simplified than made more complex, can scarce cost more than one of the old sort, though the price is not mentioned. By only turning a cock it is at pleasure made a condensing engine ; an advantage the others have not.

I have seen nothing of your searchers. Mr. Parker has received Bower, but writes me that he is at a loss how to send it, and desires you would order somebody to call for it.

I shall send the dollars for Mr. Mix per next post ; for I fancy you will not now buy this apparatus here, but choose the new air-pump from England.

With my respects to all friends, I am, &c.,

B. FRANKLIN.

CVI.

TO PETER COLLINSON.

PHILADELPHIA, 23 November, 1753.

DEAR FRIEND :—In my last, *via* Virginia, I promised to send you per next ship, a small philosophical packet ; but now, having got the materials (old letters and rough drafts) before me, I fear you will find it a great one. Nevertheless, as I am like to have a few days leisure before this ship sails, which I may not have again in a long time, I shall transcribe the whole and send it ; for you will be under no necessity of reading it all at once, but may take it a little at a time, now and then of a winter evening. When you happen to have nothing else to do (if that ever happens), it may afford you some amusement. B. FRANKLIN.

Proposal of an Experiment to measure the Time taken up by an Electric Spark in moving through any given Space. By James Alexander, of New York.

READ AT THE ROYAL SOCIETY, DECEMBER 26, 1756.

If I remember right, the Royal Society made one experiment to discover the velocity of the electric

fire, by a wire of about four miles in length, supported by silk, and by turning it forwards and backwards in a field, so that the beginning and end of the wire were at only the distance of two people, the one holding the Leyden bottle and the beginning of the wire, and the other holding the end of the wire and touching the ring of the bottle ; but by this experiment no discovery was made, except that the velocity was extremely quick.

As water is a conductor as well as metals, it is to be considered, whether the velocity of the electric fire might not be discovered by means of water ; whether a river, or lake, or sea, may not be made part of the circuit through which the electric fire passes, instead of the circuit all of wire, as in the above experiment.

Whether in a river, lake, or sea, the electric fire will not dissipate, and not return to the bottle ? or will it proceed in straight lines through the water the shortest course possible back to the bottle ?

If the last, then suppose one brook that falls into Delaware doth head very near to a brook that falls into Schuylkill ; and let a wire be stretched and supported as before, from the head of one brook to the head of the other ; and let the one end communicate with the water ; and let one person stand in the other brook, holding the Leyden bottle ; and let another person hold that end of the wire not in the water, and touch the ring of the bottle. If the electric fire will go as in the last question, then will it go down the one brook to Delaware or Schuylkill, and down one of them to their meeting, and up the other and the other brook ; the time of its doing this may possibly be observable, and the farther upwards the brooks are chosen, the more observable it would be.

Should this be not observable, then suppose the two brooks falling into Susquehanna and Delaware,

and proceeding as before, the electric fire may, by that means, make a circuit round the North Cape of Virginia, and go many hundreds of miles, and in doing that, it would seem it must take some observable time.

If still no observable time is found in that experiment, then suppose the brooks falling the one into the Ohio and the other into Susquehanna or Potomac ; in that the electric fire would have a circuit of some thousands of miles to go down Ohio to Mississippi, to the Bay of Mexico, round Florida, and round the South Cape of Virginia ; which, I think, would give some observable time, and discover exactly the velocity.

But if the electric fire dissipates or weakens in the water, as I fear it does, these experiments will not answer.

Answer to the Foregoing.

READ AT THE ROYAL SOCIETY, DECEMBER 26, 1756.

Suppose a tube of any length, open at both ends, and containing a movable wire of just the same length that fills its bore. If I attempt to introduce the end of another wire into the same tube it must be done by pushing forward the wire it already contains, and the instant I press and move one end of that wire, the other end is also moved ; and in introducing one inch of the same wire, I extrude, at the same time, an inch of the first from the other end of the tube.

If the tube be filled with water, and I inject an additional inch of water at one end, I force out an equal quantity at the other in the very same instant.

And the water forced out at one end of the tube is not the very same water that was forced in at the other end at the same time ; it was only in motion at the same time.

The long wire, made use of in the experiment to discover the velocity of the electric fluid, is itself filled with what we call its natural quantity of that fluid, before the hook of the Leyden bottle is applied to one end of it.

The outside of the bottle being, at the time of such application, in contact with the other end of the wire, the whole quantity of electric fluid contained in the wire is, probably, put in motion at once.

For at the instant the hook connected with the inside of the bottle *gives out*, the coating, or outside of the bottle, *draws in* a portion of that fluid.

If such long wire contains precisely the quantity that the outside of the bottle demands, the whole will move out of the wire to the outside of the bottle, and the over quantity which the inside of the bottle contained, being exactly equal, will flow into the wire and remain there in the place of the quantity the wire had just parted with to the outside of the bottle.

But if the wire be so long as that one tenth (suppose) of its natural quantity is sufficient to supply what the outside of the bottle demands, in such case the outside will only receive what is contained in one tenth of the wire's length, from the end next to it ; though the whole will move so as to make room at the other end for an equal quantity issuing, at the same time, from the inside of the bottle.

So that this experiment only shows the extreme facility with which the electric fluid moves in metal ; it can never determine the velocity.

And, therefore, the proposed experiment (though well imagined and very ingenious) of sending the spark round through a vast length of space, by the waters of Susquehanna, or Potomac, and Ohio, would not afford the satisfaction desired, though we could be sure that the motion of the electric fluid would be in that tract, and not under ground in the wet earth by the shortest way.

B. FRANKLIN.

*Physical and Meteorological Observations, Conjectures,
and Suppositions.*

READ AT THE ROYAL SOCIETY, JUNE 3, 1756.

The particles of air are kept at a distance from each other by their mutual repulsion.

Every three particles, mutually and equally repelling each other, must form an equilateral triangle.

All the particles of air gravitate towards the earth, which gravitation compresses them, and shortens the sides of the triangles ; otherwise their mutual repellency would force them to greater distances from each other.

Whatever particles of other matter (not endued with that repellency) are supported in air must adhere to the particles of air, and be supported by them ; for in the vacancies there is nothing they can rest on.

Air and water mutually attract each other. Hence water will dissolve in air, as salt in water.

The specific gravity of matter is not altered by dividing the matter, though the superficies be increased. Sixteen leaden bullets, of an ounce each, weigh as much in water as one of a pound, whose superficies is less.

Therefore the supporting of salt in water is not owing to its superficies being increased.

A lump of salt, though laid at rest at the bottom of a vessel of water, will dissolve therein, and its parts move every way, till equally diffused in the water; therefore there is a mutual attraction between water and salt. Every particle of water assumes as many of salt as can adhere to it; when more is added, it precipitates, and will not remain suspended.

Water, in the same manner, will dissolve in air, every particle of air assuming one or more particles of water. When too much is added, it precipitates in rain.

But there not being the same contiguity between the particles of air as of water, the solution of water in air is not carried on without a motion of the air, so as to cause a fresh accession of dry particles.

Part of a fluid, having more of what it dissolves, will communicate to other parts that have less. Thus, very salt water, coming in contact with fresh, communicates its saltiness till all is equal, and the sooner, if there is a little motion of the water.

Even earth will dissolve or mix with air. A stroke of a horse's hoof on the ground in a hot, dusty road will raise a cloud of dust that shall, if there be a light breeze, expand every way, till, perhaps, near as big as

a common house. It is not by mechanical motion communicated to the particles of dust by the hoof that they fly so far, nor by the wind that they spread so wide ; but the air near the ground, more heated by the hot dust struck into it, is rarefied and rises, and in rising mixes with the cooler air, and communicates of its dust to it, and it is at length so diffused as to become invisible. Quantities of dust are thus carried up in dry seasons ; showers wash it from the air, and bring it down again. For, water attracting it stronger, it quits the air and adheres to the water.

Air, suffering continual changes in the degrees of its heat from various causes and circumstances, and, consequently, changes in its specific gravity, must therefore be in continual motion.

A small quantity of fire mixed with water (or degree of heat therein) so weakens the cohesion of its particles that those on the surface easily quit it, and adhere to the particles of air.

A greater degree of heat is required to break the cohesion between water and air.

Air moderately heated will support a greater quantity of water invisibly than cold air ; for its particles being by heat repelled to a greater distance from each other, thereby more easily keep the particles of water that are annexed to them from running into cohesions that would obstruct, refract, or reflect the light.

Hence, when we breathe in warm air, though the same quantity of moisture may be taken up from the lungs, as when we breathe in cold air, yet that moisture is not so visible.

Water being extremely heated, that is, to the degree of boiling, its particles in quitting it so repel each other, as to take up vastly more space than before, and by that repellency support themselves, expelling the air from the space they occupy. That degree of heat being lessened, they again mutually attract ; and having no air particles mixed to adhere to, by which they might be supported and kept at a distance, they instantly fall, coalesce, and become water again.

The water commonly diffused in our atmosphere never receives such a degree of heat from the sun, or other cause, as water has when boiling ; it is not therefore supported by such heat, but by adhering to air.

Water being dissolved in and adhering to air, that air will not readily take up oil, because of the mutual repellency between water and oil.

Hence cold oils evaporate but slowly, the air having generally a quantity of dissolved water.

Oil being heated extremely, the air that approaches its surface will be also heated extremely ; the water then quitting it, it will attract and carry off oil, which can now adhere to it. Hence the quick evaporation of oil heated to a great degree.

Oil being dissolved in air, the particles to which it adheres will not take up water.

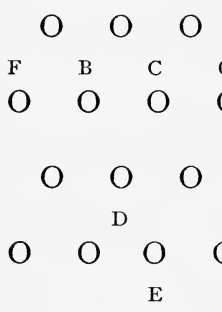
Hence the suffocating nature of air impregnated with burnt grease, as from snuffs of candles and the like. A certain quantity of moisture should be every moment discharged and taken away from the lungs ; air that has been frequently breathed is already over-

loaded, and for that reason can take no more, so will not answer the end. Greasy air refuses to touch it. In both cases suffocation for want of the discharge.

Air will attract and support many other substances.

A particle of air loaded with adhering water, or any other matter, is heavier than before, and would descend.

The atmosphere supposed at rest, a loaded descending particle must act with a force on the particles it passes between, or meets with, sufficient to overcome, in some degree, their mutual repellency, and push them nearer to each other.

Thus, supposing the particles *A*,

B, *C*, *D*, and the other near them, to
 be at the distance caused by their
 mutual repellency (confined by their
 common gravity), if *A* would de-
 scend to *E*, it must pass between
B and *C*; when it comes between
B and *C*, it will be nearer to them
 than before, and must either have
 pushed them nearer to *F* and *G*, contrary to their
 mutual repellency, or pass through by a force exceed-
 ing its repellency with them. It then approaches *D*,
 and, to move it out of the way, must act on it with a
 force sufficient to overcome its repellency with the
 two next lower particles, by which it is kept in its
 present situation.

Every particle of air, therefore, will bear any load inferior to the force of these repulsions.

Hence the support of fogs, mists, clouds.

Very warm air, clear, though supporting a very great quantity of moisture, will grow turbid and cloudy on the mixture of a colder air, as foggy, turbid air will grow clear by warming.

Thus the sun, shining on a morning fog, dissipates it ; clouds are seen to waste in a sunshiny day.

But cold condenses and renders visible the vapor ; a tankard or decanter filled with cold water will condense the moisture of warm, clear air on its outside, where it becomes visible as dew, coalesces into drops, descends in little streams.

The sun heats the air of our atmosphere most near the surface of the earth ; for there, besides the direct rays, there are many reflections. Moreover the earth, itself being heated, communicates of its heat to the neighbouring air.

The higher regions, having only the direct rays of the sun passing through them, are comparatively very cold. Hence the cold air on the tops of mountains, and snow on some of them all the year, even in the torrid zone. Hence hail in summer.

If the atmosphere were all of it (both above and below) always of the same temper as to cold or heat, then the upper air would always be *rarer* than the lower, because the pressure on it is less ; consequently lighter, and therefore would keep its place.

But the upper air may be more condensed by cold than the lower air by pressure ; the lower more expanded by heat than the upper, for want of pressure. In such case the upper air will become the heavier, the lower the lighter.

The lower region of air being heated and expanded heaves up and supports for some time the colder, heavier air above, and will continue to support it while the equilibrium is kept. Thus water is supported in an inverted open glass, while the equilibrium is maintained by the equal pressure upwards of the air below; but the equilibrium by any means breaking, the water descends on the heavier side and the air rises into its place.

The lifted heavy, cold air over a heated country, becoming by any means unequally supported, or unequal in its weight, the heaviest part descends first, and the rest follows impetuously. Hence gusts after heats, and hurricanes in hot climates. Hence the air of gusts and hurricanes cold, though in hot climates and seasons; it coming from above.

The cold air descending from above, as it penetrates our warm region full of watery particles, condenses them, renders them visible, forms a cloud thick and dark, overcasting sometimes, at once, large and extensive; sometimes, when seen at a distance, small at first, gradually increasing; the cold edge or surface of the cloud condensing the vapors next it, which form smaller clouds that join it, increase its bulk, it descends with the wind and its acquired weight, draws nearer the earth, grows denser with continual additions of water, and discharges heavy showers.

Small black clouds thus appearing in a clear sky, in hot climates, portend storms, and warn seamen to hand their sails.

The earth turning on its axis in about twenty-four hours, the equatorial parts must move about fifteen

miles in each minute ; in northern and southern latitudes this motion is gradually less to the poles, and there nothing.

If there was a general calm over the face of the globe, it must be by the air's moving in every part as fast as the earth or sea it covers.

He that sails or rides has insensibly the same degree of motion as the ship or coach with which he is connected. If the ship strikes the shore, or the coach stops suddenly, the motion continuing in the man, he is thrown forward. If a man were to jump from the land into a swift-sailing ship, he would be thrown backward (or towards the stern), not having at first the motion of the ship.

He that travels by sea or land towards the equinoctial, gradually acquires motion ; from it, loses.

But if a man were taken up from latitude 40 (where suppose the earth's surface to move twelve miles per minute) and immediately set down at the equinoctial, without changing the motion he had, his heels would be struck up, he would fall westward. If taken up from the equinoctial and set down in latitude 40, he would fall eastward.

The air under the equator, and between the tropics, being constantly heated and rarefied by the sun, rises. Its place is supplied by air from northern and southern latitudes, which, coming from parts where the earth and air had less motion, and not suddenly acquiring the quicker motion of the equatorial earth,¹ appears an

¹ See a paper on this subject, by the late ingenious Mr. Hadley, in the Philosophical Transactions, wherein

this hypothesis for explaining the trade-winds first appeared.—F.

east wind blowing westward, the earth moving from west to east, and slipping under the air.

Thus when we ride in a calm it seems a wind against us ; if we ride with the wind, and faster, even that will seem a small wind against us.

The air rarefied between the tropics, and rising, must flow in the higher region north and south. Before it rose, it had acquired the greatest motion the earth's rotation could give it. It retains some degree of this motion, and descending in higher latitudes, where the earth's motion is less, will appear a westerly wind, yet tending towards the equatorial parts, to supply the vacancy occasioned by the air of the lower regions flowing thitherwards.

Hence our general cold winds are about northwest ; our summer cold gusts the same.

The air in sultry weather, though not cloudy, has a kind of haziness in it, which makes objects at a distance appear dull and indistinct. This haziness is occasioned by the great quantity of moisture equally diffused in that air. When, by the cold wind blowing down among it, it is condensed into clouds, and falls in rain, the air becomes purer and clearer. Hence, after gusts, distant objects appear distinct, their figures sharply terminated.

Extreme cold winds congeal the surface of the earth, by carrying off its fire. Warm winds, afterwards blowing over that frozen surface, will be chilled by it. Could that frozen surface be turned under, and a warmer turned up from beneath it, those warm winds would not be chilled so much. ;

The surface of the earth is also sometimes much heated by the sun ; and such heated surface, not being changed, heats the air that moves over it.

Seas, lakes, and great bodies of water, agitated by the winds, continually change surfaces ; the cold surface in winter is turned under by the rolling of the waves, and a warmer turned up ; in summer, the warm is turned under, and colder turned up. Hence the more equal temper of sea water, and the air over it. Hence, in winter, winds from the sea seem warm, winds from the land cold. In summer, the contrary.

Therefore the lakes northwest of us,¹ as they are not so much frozen nor so apt to freeze as the earth, rather moderate than increase the coldness of our winter winds.

The air over the sea being warmer, and therefore lighter in winter than the air over the frozen land, may be another cause of our general northwest winds, which blow off to sea at right angles from our North American coast ; the warm, light sea air rising, the heavy, cold land air pressing into its place.

Heavy fluids descending frequently form eddies or whirlpools, as is seen in a funnel where the water acquires a circular motion, receding every way from a centre, and leaving a vacancy in the middle, greatest above, and lessening downwards, like a speaking-trumpet, its big end upwards.

Air descending or ascending may form the same kind of eddies or whirlings, the parts of air acquiring

¹ In Pennsylvania.

a circular motion, and receding from the middle of the circle by a centrifugal force, and leaving there a vacancy, if descending, greatest above, and lessening downwards; if ascending, greatest below, and lessening upwards, like a speaking-trumpet, standing its big end on the ground.

When the air descends with violence in some places, it may rise with equal violence in others, and form both kinds of whirlwinds.

The air, in its whirling motion receding every way from the centre or axis of the trumpet, leaves there a vacuum, which cannot be filled through the sides, the whirling air, as an arch, preventing; it must then press in at the open ends.

The greatest pressure inwards must be at the lower end, the greatest weight of the surrounding atmosphere being there. The air entering rises within, and carries up dust, leaves, and even heavier bodies that happen in its way as the eddy or whirl passes over land.

If it passes over water, the weight of the surrounding atmosphere forces up the water into the vacuity, part of which, by degrees, joins with the whirling air, and adding weight, and receiving accelerated motion, recedes still farther from the centre or axis of the trump as the pressure lessens, and at last, as the trump widens, is broken into small particles, and so united with air as to be supported by it, and become black clouds at the top of the trump.

Thus these eddies may be whirlwinds at land, water-spouts at sea. A body of water so raised may

be suddenly let fall when the motion, &c., has not strength to support it, or the whirling arch is broken so as to admit the air ; falling in the sea it is harmless, unless ships happen under it ; but if in the progressive motion of the whirl it has moved from the sea over the land, and then breaks, sudden, violent, and mischievous torrents are the consequences.

B. FRANKLIN.

CVII.

TO WILLIAM SMITH.

PHILADELPHIA, 27 November, 1753.

DEAR SIR:—Having written to you fully, via Bristol, I have now little to add. Matters relating to the Academy remain *in statu quo*. The trustees would be glad to see a rector established there, but they dread entering into new engagements till they are got out of debt ; and I have not yet got them wholly over to my opinion, that a good professor or teacher of the higher branches of learning would draw so many scholars as to pay great part, if not the whole, of his salary. Thus, unless the Proprietors of the province shall think fit to put the finishing hand to our institution, it must, I fear, wait some few years longer before it can arrive at that state of perfection which to me it seems now capable of ; and all the pleasure I promised myself in seeing you settled among us vanishes into smoke. But good Mr. Collinson writes me word that no endeavours of his shall be wanting ; and he hopes, with the Archbishop's

assistance, to be able to prevail with our Proprietors.¹
I pray God grant them success. My son presents
his affectionate regards, with, dear Sir, yours, &c.,
B. FRANKLIN.

CVIII.

TO CADWALLADER COLDEN.

PHILADELPHIA, 6 December, 1753.

DEAR SIR:—I received your favor of the 19th past, with some remarks on my meteorological paper, for which I thank you and return some observations on those remarks, hoping by this friendly intercourse of sentiments and objections some advantage will arise, to the increase of true knowledge.

I sent you our treaty some time since. You will find very little in it; but I have hopes it will introduce a regulation of our Indian trade, by the government taking it in hand and furnishing the Indians with goods at the cheapest rate without aiming at profit, as is done by Massachusetts; by which means I think we must vastly undersell the French, and thereby attach the Indians more firmly to the British interest.

Mr. Collinson certainly received your answer to Kastner. I think one of his letters to me mentions it.

I send you herewith a copy of my paper on the *Increase of Mankind*; the only one I have, so must

¹ Upon the application of Archbishop Herring and Peter Collinson, at Dr. Franklin's request (aided by the letters of Mr. Allen and Mr. Peters), Thomas

Penn subscribed an annual sum, and afterwards gave at least £5,000, to the founding or engrafting the College upon the Academy.—STUBER.

request you to return it. That on the *Air*, &c., is what you have already seen. The third mentioned to you by Mr. Collinson concerning the Germans, is scarcely worth sending. It will contain nothing new to you.

I congratulate you on Lord Halifax's approbation of your conduct in public affairs. From such a man the honor is great, and the satisfaction; but the approbation of your own mind is something more valuable in itself, and it is what I doubt not you will always enjoy.

I should like to see Pike's book some time or other, when you can conveniently send it. With great respect and esteem, I am, Sir, &c.,

B. FRANKLIN.

CIX.

TO JAMES BOWDOIN.

PHILADELPHIA, 13 December, 1753.

DEAR SIR:—I received your favor of the 12th ultimo, with the law of your province for regulating the Indian trade, for which I thank you, and for the remarks that accompany it, which clearly evince the usefulness of the law, and I hope will be sufficient to induce our Assembly to follow your example.

I have yet received no particulars of the unhappy gentleman's death at Petersburg, (whose fate I lament). One of the papers says that all the letters from thence confirm the account, and mentions his name (Professor Richmann), but nothing farther.

No doubt we shall have a minute account of the accident with all its circumstances, in some of the magazines or the Transactions of the Royal Society.¹

The observation you made of the sea water emitting more and less light in different tracts passed through by your boat is new, and your manner of accounting for it ingenious. It is indeed very possible that an extremely small animalcule, too small to be visible even by the best glasses, may yet give a visible light. I remember to have taken notice, in a drop of kennel water, magnified by the solar microscope to the bigness of a cart-wheel, there were numbers of visible animalcules of various sizes swimming about; but I was sure there were likewise some which I could not see, even with that magnifier, for the wake they made in swimming to and fro was very visible, though the body that made it was not so. Now if I could see the wake of an invisible animalcule, I imagine I might much more easily see its light if it were of the luminous kind. For how small is the extent of a ship's wake, compared with that of the light of her lantern.

My barometer will not show the luminous appearance by agitating the mercury in the dark, but I think yours does. Please to try whether it will, when agitated, attract a fine thread hung near the top of the tube.

As to the answer to Nollet, if I were going on with it, I should be extremely glad of your peeping into it (as you say) now and then, that I might correct it by

¹ Professor Richmann was killed at Petersburg, on the 26th of July, 1753, while repeating Franklin's experiment

for bringing electricity from the clouds. He received a shock, which caused instantaneous death.

your advice. The materials in short hints have been long collected and methodized ; they only want to be clothed with expression. But soon after my return from New England, I received the enclosed from Monsieur Dalibard, wherein he tells me that he is preparing an answer, not only to the Abbé, but to some others that have wrote against my doctrine, which will be published the beginning of this winter. This, with a good deal of business, and a little natural indolence, has made me neglect finishing my answer till I shall see what is done by him. Perhaps it may then appear unnecessary for me to do any thing farther in it. And will not one's vanity be more gratified in seeing one's adversary confuted by a disciple than even by one's self ? I am, however, a little concerned for Dalibard, when I find by his letter that he has been so far imposed on by the Abbé's confident assertion that a charged bottle placed on an *electric per se* loses its electricity, as to attempt to account for it, when the thing is absolutely not fact. I have in answer wrote him my sentiments on that and some other particulars of the Abbé's book, which I hope will get to hand before his answer is published.¹

I am with the greatest esteem and regard,

Dear Sir, your most obliged humble servant,

B. FRANKLIN.

¹ The Abbé Nollet published in Paris a volume entitled : " Lettres sur l'Electricité, dans lesquelles on examine les découvertes qui ont été faites sur cette matière depuis l'Année 1752, et les conséquences que l'on en peut tirer." In the first volume were six letters directed to Franklin, designed to con-

fute his doctrines and hypotheses. The Abbé's effort brought into the field several champions of Dr. Franklin, among whom were David Colden, a son of Cadwallader Colden, of New York, and Monsieur Dalibard, of Paris. Franklin decided that the Abbé's letters did not require any reply from him.

CX.

TO PETER COLLINSON.

PHILADELPHIA, 18 April, 1754.

SIR :—Since September last, having been abroad on two long journeys and otherwise much engaged, I have made but few observations on the *positive* and *negative* state of electricity in the clouds. But Mr. Kinnersley kept his rod and bells in good order, and has made many.

Once this winter the bells rang a long time during a fall of snow, though no thunder was heard or lightning seen. Sometimes the flashes and cracks of the electric matter between bell and bell were so large and loud as to be heard all over the house; but by all his observations the clouds were constantly in a negative state, till about six weeks ago, when he found them once to change in a few minutes from the negative to the positive. About a fortnight after that he made another observation of the same kind, and last Monday afternoon, the wind blowing hard at southeast and veering round to northeast, with many thick, driving clouds, there were five or six successive changes from negative to positive, and from positive to negative, the bells stopping a minute or two between every change. Besides the methods mentioned in my paper of September last of discovering the electrical state of the clouds, the following may be used. When your bells are ringing, pass a rubbed tube by the edge of the bell, connected with your pointed rod; if the cloud is then in a negative

state, the ringing will stop ; if in a positive state, it will continue, and perhaps be quicker. Or suspend a very small cork ball by a fine silk thread, so that it may hang close to the edge of the rod-bell ; then, whenever the bell is electrified, whether positively or negatively, the little ball will be repelled and continue at some distance from the bell. Have ready a round-headed glass stopper of a decanter, rub it on your side till it is electrified, then present it to the cork ball. If the electricity in the ball is positive, it will be repelled from the glass stopper, as well as from the bell ; if negative, it will fly to the stopper.

B. FRANKLIN.¹

CXI.

TO CADWALLADER COLDEN.

PHILADELPHIA, 30 August, 1754.

DEAR SIR :—I have now before me your favors of July 23d, and August 15th. I return Mr. Pike's *Philosophia Sacra*. His manner of philosophizing is much out of my way.

I am now about to proceed on my eastern journey, but hope to be at home in the winter, the best season for electrical experiments, when I will gladly make any you desire. In the mean time I should be glad if you would communicate the thoughts you mention, that I may consider them. If you please, direct them to me at Boston.

There must, I think, be some mistake in what you

¹ Soon after writing this letter Franklin set out on a tour to New England.

mention, of my having sent to Mr. Collinson the paper you wrote me on water-spouts. I have the original now by me, and cannot recollect that I ever copied it, or that I ever communicated the contents of it to Mr. Collinson or any one. Indeed, I have long had an intention of sending him all I have wrote, and all I have received from others on this curious subject, without mentioning names; but it is not yet done.

Our Assembly were not inclined to show any approbation of the plan of union; yet I suppose they will take no steps to oppose its being established by the government at home. Popular elections have their inconveniences in some cases; but in establishing new forms of government, we cannot always obtain what we may think the best; for the prejudices of those concerned, if they cannot be removed, must be in some degree complied with. However, I am of opinion that when troops are to be raised in America, the officers appointed must be men they know and approve, or the levies will be made with more difficulty, and at much greater expense.¹

It is not to be expected that a Quaker Assembly will establish any but Quaker schools; nor will they ever agree to a tax for the payment of any clergy. It is intended by the Society, that the schoolmasters among the Germans shall teach English.

I am glad the representation is agreeable to your sentiments. The letter to Lord Halifax I suppose your son sends from New York.

¹ The author had recently returned from the Convention at Albany, where he had proposed his celebrated *Plan*

of Union. This Plan, and Mr. Colden's remarks on some parts of it, may be found in No. CXII.

Since my return I have received from Italy a book in quarto, entitled *Dell' Elettricismo Artificiale e Naturale, Libri Due, di Giovambattista Beccaria de' CC. RR. delle Scuole Pie*, printed at Turin, and dedicated to the King. The author professedly goes on my principles; he seems a master of method, and has reduced to systematic order the scattered experiments and positions delivered in my paper. At the end of the first book, there is a letter addressed to the Abbé Nollet, in which he answers some of the Abbé's principal objections. This letter being translated into French, I send you the translation for your perusal, and will send you the Italian book itself by some future opportunity, if you desire it. It pleases me the more, in that I find the author has been led by sundry observations and experiments, though different from mine, to the same strange conclusion, viz., *that some thunder-strokes are from the earth upwards*; in which I feared I should for some time have been singular.

With the greatest esteem and regard I am, dear Sir, &c.,

B. FRANKLIN.

P. S.—Please to send me the French piece by the first opportunity, after you have perused it, directed to me at Boston.

CXII.

PLAN OF UNION FOR THE COLONIES.

In anticipation of unpleasant complications with France, the Lords of Trade directed commissioners to be appointed in several of the provinces, to assemble at Albany, for the specific purpose of conciliating and attaching to them the Six Nations, whose alliance was of vital importance in case of a war with France.

The commissioners met on the 19th of June, 1754. The colonies of New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, Pennsylvania, and Maryland were represented by twenty-five commissioners, or delegates. Franklin was the commissioner from Pennsylvania. Several days were spent in distributing presents and holding "talks" with the Indians. On the 24th of June the journal of the commissioners shows the following record :

"A motion was made that the commissioners deliver their opinion whether a union of all the colonies is not at present absolutely necessary for their security and defence. The question was accordingly put, and passed in the affirmative *unanimously*.

"On a motion made, that a committee be appointed to prepare and receive plans or schemes for the union of the colonies, and to digest them into one general plan for the inspection of this Board ; Resolved, that each government choose one of their own number to be of that committee. Accordingly were appointed Thomas Hutchinson for Massachusetts, Theodore Atkinson for New Hampshire, William Pitkin for Connecticut, Stephen Hopkins for Rhode Island, William Smith for New York, Benjamin Franklin for Pennsylvania, and Benjamin Tasker for Maryland."

It is a significant and curious fact that, with the exception of those from Massachusetts, none of the delegates had any instructions to discuss the question of a union of the colonies for mutual defence, or for any other purpose. Their instructions restricted them to the concerting of measures best calculated to secure the friendship of the Six Nations, and to resist the encroachment of the French and their allies. The Massachusetts commissioners were authorized to "enter into articles of union and confederation for the general defence of his Majesty's subjects and interests in North America, *as well in time of peace as of war*." Though not within the instructions of the commissioners, there are abundant reasons for believing that some plan of union was the subject of much more thought and discussion than the friendship of the Indians, a subject, however, which was not neglected. It certainly had been the uppermost thought in Franklin's mind for some time. The *Pennsylvania Gazette* for May 9th, 1754, contains an account, evidently from his pen, of the capture by the French of Captain Trent's party, who were erecting a fort (afterwards Fort Duquesne) at the fork of the Ohio. After narrating the particulars, and urging union to resist aggression, he adds : "The confidence of the French in this undertaking seems well grounded in the present disunited state of the British colonies, and the extreme difficulty of bringing so many different governments and assemblies to agree in any speedy and effectual measures for our common defence and security ; while our enemies have the very great advantage of being under one direction, with one council, and one purse." At the end of the article is a woodcut, in which is the figure of a snake, separated into parts, to each of which is affixed the initial of one of the colonies, and at the bottom in large capital letters the motto, JOIN OR DIE. It is not surprising, therefore, that when Franklin arrived at Albany,

he had in his pocket a "plan of union" which he had submitted to several influential friends in New York, and received their approval of it. Several other plans were submitted to the committee, but his was approved of, and reported to the commissioners. Its various features were under discussion twelve days, and finally adopted, subject to the confirmation of Parliament, which was judged necessary to give such a union validity. Though the commissioners were nearly or quite unanimous in approving Franklin's plan of union—Trumbull says the Connecticut delegates did not approve of it, though they did approve of the union,—it met with a very different reception from the colonial assemblies to whom it was submitted, while in England, it proved so unacceptable that the Board of Trade did not even recommend it to the notice of the king. Franklin says: "The Assemblies all thought there was too much *prerogative* in it, and in England it was thought to have too much of the *democratic*." The home government had doubtless much the same reasons for discouraging such a union as the Roman emperors had for refusing to allow the servile population to be put in uniform; they did not care to give them such facilities for learning their own strength.

Short Hints towards a Scheme for Uniting the Northern Colonies.

A GOVERNOR-GENERAL.

To be appointed by the King.

To be a military man.

To have a salary from the crown.

To have a negation on all acts of the Grand Council, and carry into execution whatever is agreed on by him and that Council.

GRAND COUNCIL.

One member to be chosen by the Assembly of each of the smaller colonies, and two or more by each of the larger, in proportion to the sums they pay yearly into the general treasury.

MEMBERS' PAY.

— shillings sterling per diem, during their sitting, and milage for travelling expenses.

PLACE AND TIME OF MEETING.

To meet — times in every year, at the capital of each colony, in course, unless particular circumstances and emergencies require more frequent meetings and alteration in the course of places. The governor-general to judge of those circumstances, &c., and call by his writs.

GENERAL TREASURY.

Its fund, an excise on strong liquors, pretty equally drunk in the colonies, or duty on liquor imported, or — shillings on each license of a public house, or excise on superfluities, &c., &c. All which would pay in some proportion to the present wealth of each colony, and increase as that wealth increases, and prevent disputes about the inequality of quotas. To be collected in each colony and lodged in their treasury, to be ready for the payment of orders issuing from the governor-general and Grand Council jointly.

DUTY AND POWER OF THE GOVERNOR-GENERAL
AND GRAND COUNCIL.

To order all Indian treaties. Make all Indian purchases not within proprietary grants. Make and support new settlements by building forts, raising and paying soldiers to garrison the forts, defend the frontiers, and annoy the enemy. Equip guard-vessels to scour the coasts from privateers in time of war, and protect the trade, and every thing that shall be found necessary for the defence and support of the colonies in general, and increasing and extending their settlements, &c.

For the expense, they may draw on the fund in the treasury of any colony.

MANNER OF FORMING THIS UNION.

The scheme being first well considered, corrected, and improved by the commissioners at Albany, to be sent home, and an act of Parliament obtained for establishing it.¹

*Letter from James Alexander to Cadwallader Colden,
Respecting the Above Hints.*

NEW YORK, [June] 9, 1754.

DEAR SIR :

I had some conversation with Mr. Franklin and Mr. Peters² as to the uniting the colonies, and the difficulties thereof, by effecting our liberties on the one hand, or being ineffectual on the other. Whereon Mr. Franklin promised to set down some hints of a scheme that he thought might do, which accordingly he sent to me to be transmitted to you, and it is enclosed.

To me it seems extremely well digested, and at first sight avoids many difficulties that had occurred to me.

Some difficulties still remain. For example, there cannot be found men tolerably well skilled in warlike affairs to be chosen for the Grand Council, and there is danger in communicating to them the schemes to be put in execution, for fear of a discovery to the enemy.

Whether this may not be in some measure remedied by a council of state of a few persons to be chosen by the Grand

¹ This paper was communicated to James Alexander, with the following note :

"NEW YORK, June 8, 1754.

"Mr. Alexander is requested to peruse these *Hints*, and make remarks in correcting or improving the scheme, and send the paper, with such remarks,

to Dr. Colden for his sentiments, who is desired to forward the whole to Albany, to their very humble servant,
"B. FRANKLIN."

² Mr. Peters was one of the delegates to the Albany Convention from Pennsylvania.

Council at their stated meetings, which council of state to be always attending the governor-general, and with him to digest beforehand all matters to be laid before the next Grand Council, and only the general, but not the particular, plans of operation.

That the governor-general and that council of state issue orders for the payment of moneys, so far as the Grand Council have beforehand agreed may be issued for any general plan to be executed. That the governor-general and council of state, at every meeting of the Grand Council, lay before them their accounts and transactions since the last meeting; at least so much of their transactions as is safe to be made public. This council of state to be something like that of the United Provinces, and the Grand Council to resemble the States-General.

That the capacity and ability of the persons to be chosen of the council of state and Grand Council be their only qualifications, whether members of the respective bodies that choose them or not. That the Grand Council, with the governor-general, have power to increase, but not to decrease, the duties laid by act of Parliament, and have power to issue bills of credit on emergencies, to be sunk by the increased funds, bearing a small interest, but not to be tenders. I am, dear Sir,

Your most obedient,

and most humble servant,

JAMES ALEXANDER.

*Remarks on the Hints for a Scheme of Union, by
Cadwallader Colden.*

GOVERNOR-GENERAL.

It seems agreed on all hands that something is necessary to be done for uniting the colonies in their mutual defence, and it seems to be likewise agreed that it can only be done effectually by act of Parliament. For this reason I suppose

that the necessary funds for carrying it into execution, in pursuance of the ends proposed by it, cannot be otherwise obtained. If it were thought that the Assemblies of the several colonies may agree to lay the same duties and apply them to the general defence and security of all the colonies, no need of an act of Parliament.

Quære: Which best for the colonies; by Parliament, or by the several Assemblies?

The King's ministers, so long since as the year 1723 or 1724, had thoughts of sending over a governor-general of all the colonies, and the Earl of Stair was proposed as a fit person. It is probable, the want of a suitable support of the dignity of that office prevented that scheme's being carried into execution, and that the ministry and people of England think that this charge ought to be borne by the colonies.

GRAND COUNCIL.

Quære: Is the Grand Council, with the governor-general, to have a legislative authority? If only an executive power, objections may be made to their being elective. It would be in a great measure a change of the constitution, to which I suspect the crown will not consent. We see the inconveniences attending the present constitution, and remedies may be found without changing it, but we cannot foresee what may be the consequences of a change in it. If the Grand Council be elected for a short time, steady measures cannot be pursued. If elected for a long time, and not removable by the crown, they may become dangerous. Are they to have a negative on the acts of the governor-general? It is to be considered that England will keep their colonies, so far as they can, dependent on them; and this view is to be preserved in all schemes to which the King's consent is necessary.

PLACE AND TIME OF MEETING.

It may be thought dangerous to have fixed meetings of the Grand Council, and in all the colonies at certain times and

places. It is a privilege which the Parliament has not, nor the Privy Council, and may be thought destructive of the constitution.

GENERAL TREASURY.

Some estimate ought to be made of the produce which may be reasonably expected from the funds proposed to be raised by duties on liquors, &c., to see whether it will be sufficient for the ends proposed. This I think may be done from the custom-houses in the most considerable places for trade in the colonies.

MANNER OF FORMING THE UNION.

No doubt any private person may, in the proper manner, make any proposals which he thinks for the public benefit ; but, if they are to be made by the commissioners of the several colonies, who now meet at Albany, it may be presumed that they speak the sense of their constituents. What authority have they to do this ? I know of none from either the Council or Assembly of New York.

However, these things may be properly talked of in conversation among the commissioners for further information, and in order to induce the several Assemblies to give proper powers to commissioners to meet afterwards for this purpose.

Reasons and Motives on which the Plan of Union was Formed.

The commissioners from a number of the northern colonies being met at Albany, and considering the difficulties that have always attended the most necessary general measures for the common defence, or for the annoyance of the enemy, when they were to be carried through the several particular Assemblies of all the colonies : some Assemblies being before at variance with their governors or councils, and the

several branches of the government not on terms of doing business with each other; others taking the opportunity, when their concurrence is wanted, to push for favorite laws, powers, or points, that they think could not at other times be obtained, and so creating disputes and quarrels; one Assembly waiting to see what another will do, being afraid of doing more than its share, or desirous of doing less, or refusing to do any thing, because its country is not at present so much exposed as others, or because another will reap more immediate advantage;—from one or other of which causes, the Assemblies of six out of seven colonies applied to had granted no assistance to Virginia, when lately invaded by the French, though purposely convened, and the importance of the occasion earnestly urged upon them;—considering, moreover, that one principal encouragement to the French in invading and insulting the British American dominions, was their knowledge of our disunited state, and of our weakness arising from such want of union; and that from hence different colonies were, at different times, extremely harassed, and put to great expense both of blood and treasure, who would have remained in peace, if the enemy had had cause to fear the drawing on themselves the resentment and power of the whole;—the said commissioners, considering also the present encroachments of the French, and the mischievous consequences that may be expected from them, if not opposed with our force, came to an unanimous resolution: *That a union of the colonies is absolutely necessary for their preservation.*

The manner of forming and establishing this union was the next point. When it was considered that the colonies were seldom all in equal danger at the same time, or equally near the danger, or equally sensible of it, that some of them had particular interests to manage, with which a union might interfere, and that they were extremely jealous of each other, it was thought impracticable to obtain a joint agreement of all the colonies to a union, in which the expense and burthen of defending any of them should be divided among them all ; and if ever acts of Assembly in all the colonies could be obtained for that purpose, yet as any colony, on the least dissatisfaction, might repeal its own act, and thereby withdraw itself from the union, it would not be a stable one, or such as could be depended on ; for if only one colony should, on any disgust, withdraw itself, others might think it unjust and unequal that they, by continuing in the union, should be at the expense of defending a colony which refused to bear its proportional part, and would therefore one after another withdraw, till the whole crumbled into its original parts. Therefore the commissioners came to another previous resolution, *That it was necessary the Union should be established by act of Parliament.*

They then proceeded to sketch out a *Plan of Union*, which they did in a plain and concise manner, just sufficient to show their sentiments of the kind of union that would best suit the circumstances of the colonies, be most agreeable to the people, and most effectually promote his Majesty's service and the

general interest of the British empire. This was respectfully sent to the Assemblies of the several colonies for their consideration, and to receive such alterations and improvements as they should think fit and necessary; after which it was proposed to be transmitted to England to be perfected, and the establishment of it there humbly solicited.

This was as much as the commissioners could do.

It was proposed by some of the commissioners to form the colonies into two or three distinct unions; but for these reasons that proposal was dropped even by those that made it, viz. :

1. In all cases where the strength of the whole was necessary to be used against the enemy, there would be the same difficulty in degree to bring the several unions to unite together as now the several colonies; and consequently the same delays on our part and advantage to the enemy.

2. Each union would separately be weaker than when joined by the whole, obliged to exert more force, be oppressed by the expense, and the enemy less deterred from attacking it.

3. Where particular colonies have *selfish views*, as New York, with regard to Indian trade and lands; or are less exposed, being covered by others, as New Jersey, Rhode Island, Connecticut, Maryland; or have particular whims and prejudices against warlike measures in general, as Pennsylvania, where the Quakers predominate; such colonies would have more weight in a partial union, and be better able to oppose and obstruct the measures necessary for the

general good, than where they are swallowed up in the general union.

4. The Indian trade would be better regulated by the union of the whole than by the partial unions. And as Canada is chiefly supported by that trade, if it could be drawn into the hands of the English, as it might be if the Indians were supplied on moderate terms, and by honest traders appointed by and acting for the public; that alone would contribute greatly to the weakening of our enemies.

5. The establishing of new colonies westward on the Ohio and the Lakes,—a matter of considerable importance to the increase of British trade and power, to the breaking that of the French, and to the protection and security of our present colonies, would best be carried on by a joint union.

6. It was also thought that by the frequent meetings together of commissioners or representatives from all the colonies, the circumstances of the whole would be better known, and the good of the whole better provided for; and that the colonies would, by this connexion, learn to consider themselves, not as so many independent states, but as members of the same body; and thence be more ready to afford assistance and support to each other, and to make diversions in favor even of the most distant, and to join cordially in any expedition for the benefit of all against the common enemy.

These were the principal reasons and motives for forming the Plan of Union as it stands. To which may be added this, that as the union of the—[The remainder of this article was lost.]

*Plan of Union Adopted by the Convention at Albany,
with the Reasons and Motives for Each Article of
the Plan.¹*

It is proposed that humble application be made for an act of Parliament of Great Britain, by virtue of which one general government may be formed in America, including all the said colonies, within and under which government each colony may retain its present constitution, except in the particulars wherein a change may be directed by the said act, as hereafter follows.

PRESIDENT-GENERAL AND GRAND COUNCIL.

That the said general government be administered by a President-General, to be appointed and supported by the crown; and a Grand Council, to be chosen by the representatives of the people of the several colonies met in their respective Assemblies.

It was thought that it would be best the President-General should be supported as well as appointed by the crown, that so all disputes between him and the Grand Council concerning his salary might be pre-

¹ The several *Articles*, as originally adopted, are printed in Italic type; the reasons and motives in Roman.

It is to be observed that the union was to extend to the colonies of New Hampshire, Massachusetts, Connecticut, Rhode Island, New York, New Jersey, Pennsylvania, Maryland, Virginia, North Carolina, and South Carolina (being all the British Colonies at that time in North America, except Georgia and Nova Scotia), "for their mutual defence and security, and for extending the British settlements in North America." An-

other plan was proposed to the Convention, which included only New Hampshire, Massachusetts, Connecticut, Rhode Island, New York, and New Jersey. This was printed in the volume of the collections of the Massachusetts Historical Society for 1800. It is a rough draft of the above plan, with some unimportant variations. It would seem, by the *Hints* communicated to Mr. Alexander, that Franklin himself did not at first contemplate any thing more than a union of the northern colonies.—SPARKS.

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vented; as such disputes have been frequently of mischievous consequence in particular colonies, especially in time of public danger. The quit-rents of crown lands in America might in a short time be sufficient for this purpose. The choice of members for the Grand Council is placed in the House of Representatives of each government, in order to give the people a share in this new general government, as the crown has its share by the appointment of the President-General.

But it being proposed by the gentlemen of the council of New York, and some other counsellors among the commissioners, to alter the plan in this particular, and to give the governors and council of the several provinces a share in the choice of the Grand Council, or at least a power of approving and confirming, or of disallowing, the choice made by the house of representatives, it was said :

“That the government or constitution, proposed to be formed by the plan, consists of two branches: a President-General appointed by the crown, and a council chosen by the people, or by the people’s representatives, which is the same thing.

“That by a subsequent article, the council chosen by the people can effect nothing without the consent of the President-General appointed by the crown; the crown possesses therefore full one half of the power of this constitution.

“That in the British constitution, the crown is supposed to possess but one third, the lords having their share.

“ That this constitution seemed rather more favorable for the crown.

“ That it is essential to English liberty, that the subject should not be taxed but by his own consent, or the consent of his elected representatives.

“ That taxes to be laid and levied by this proposed constitution will be proposed and agreed to by the representatives of the people, if the plan in this particular be preserved ;

“ But if the proposed alteration should take place, it seemed as if matters may be so managed as that the crown shall finally have the appointment, not only of the President-General, but of a majority of the Grand Council ; for seven out of eleven governors and councils are appointed by the crown ;

“ And so the people in all the colonies would in effect be taxed by their governors.

“ It was therefore apprehended that such alterations of the plan would give great dissatisfaction, and that the colonies could not be easy under such a power in governors, and such an infringement of what they take to be English liberty.

“ Besides, the giving a share in the choice of the Grand Council would not be equal with respect to all the colonies, as their constitutions differ. In some, both governor and council are appointed by the crown. In others, they are both appointed by the proprietors. In some, the people have a share in the choice of the council ; in others, both government and council are wholly chosen by the people. But the House of Representatives is everywhere chosen by the

people ; and, therefore, placing the right of choosing the Grand Council in the representatives is equal with respect to all.

“ That the Grand Council is intended to represent all the several houses of representatives of the colonies, as a house of representatives doth the several towns or counties of a colony. Could all the people of a colony be consulted and unite in public measures, a house of representatives would be needless, and could all the Assemblies conveniently consult and unite in general measures, the Grand Council would be unnecessary.

“ That a House of Commons or the House of Representatives and the Grand Council are thus alike in their nature and intention. And as it would seem improper that the King or House of Lords should have a power of disallowing or appointing members of the House of Commons ; so likewise, that a governor and council appointed by the crown should have a power of disallowing or appointing members of the Grand Council, who, in this constitution, are to be the representatives of the people.

✓ “ If the governors and councils, therefore, were to have a share in the choice of any that are to conduct this general government, it should seem more proper that they choose the President-General. But this being an office of great trust and importance to the nation, it was thought better to be filled by the immediate appointment of the crown.

✓ “ The power proposed to be given by the plan to the Grand Council is only a concentration of the pow-

ers of the several Assemblies in certain points for the general welfare ; as the power of the President-General is, of the powers of the several governors in the same points.

“ And as the choice therefore of the Grand Council by the representatives of the people neither gives the people any new powers nor diminishes the power of the crown, it was thought and hoped the crown would not disapprove of it.”

Upon the whole, the commissioners were of opinion that the choice was most properly placed in the representatives of the people.

ELECTION OF MEMBERS.

That within — months after the passing of such act, the House of Representatives that happens to be sitting within that time, or that shall be especially for that purpose convened, may and shall choose members for the Grand Council in the following proportion—that is to say :

<i>Massachusetts Bay</i> 7	<i>Pennsylvania</i> 6
<i>New Hampshire</i> 2	<i>Maryland</i> 4
<i>Connecticut</i> 5	<i>Virginia</i> 7
<i>Rhode Island</i> 2	<i>North Carolina</i> 4
<i>New York</i> 4	<i>South Carolina</i> 4
<i>New Jersey</i> 3	—
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It was thought that if the least colony was allowed more than two, and the others in proportion, the number would be very great, and the expense heavy ; and that less than two would not be convenient, as a single ✓

✓ person being by any accident prevented appearing at the meeting, the colony he ought to appear for would not be represented. That as the choice was not immediately popular, they would be generally men of good abilities for business, and men of reputation for integrity ; and that forty-eight such men might be a number sufficient. But though it was thought reasonable that each colony should have a share in the representative body in some degree according to the proportion it contributed to the general treasury, yet the proportion of wealth or power of the colonies is not to be judged by the proportion here fixed ; because it was at first agreed that the greatest colony should not have more than seven members, nor the least less than two ; and the setting these proportions between these two extremes was not nicely attended to, as it would find itself, after the first election, from the sums brought into the treasury, as by a subsequent article.

PLACE OF FIRST MEETING.

—who shall meet for the first time at the city of Philadelphia in Pennsylvania, being called by the President-General as soon as conveniently may be after his appointment.

Philadelphia was named as being nearer the centre of the colonies, where the commissioners would be well and cheaply accommodated. The high roads through the whole extent, are for the most part very good, in which forty or fifty miles a day may very well be, and frequently are, travelled. Great part of the way may likewise be gone by water. In summer

time the passages are frequently performed in a week from Charleston to Philadelphia and New York ; and from Rhode Island to New York, through the Sound, in two or three days ; and from New York to Philadelphia, by water and land, in two days, by stage, boats, and wheel carriages that set out every other day. The journey from Charleston to Philadelphia may likewise be facilitated by boats running up Chesapeake Bay three hundred miles. But if the whole journey be performed on horseback, the most distant members, viz., the two from New Hampshire and from South Carolina, may probably render themselves at Philadelphia in fifteen to twenty days ; the majority may be there in much less time.

NEW ELECTION.

That there shall be a new election of the members of the Grand Council every three years ; and on the death or resignation of any member, his place should be supplied by a new choice at the next sitting of the Assembly of the colony he represented.

Some colonies have annual assemblies, some continue during a governor's pleasure ; three years was thought a reasonable medium, as affording a new member time to improve himself in the business, and to act after such improvement, and yet giving opportunities, frequently enough, to change him if he has misbehaved.

PROPORTION OF MEMBERS AFTER THE FIRST THREE YEARS.

That after the first three years, when the proportion of money arising out of each colony to the general

treasury can be known, the number of members to be chosen for each colony shall from time to time, in all ensuing elections, be regulated by that proportion, yet so as that the number to be chosen by any one province be not more than seven, nor less than two.

By a subsequent article it is proposed that the General Council shall lay and levy such general duties as to them may appear most equal and least burthensome, &c. Suppose, for instance, they lay a small duty or excise on some commodity imported into or made in the colonies, and pretty generally and equally used in all of them, as rum, perhaps, or wine; the yearly produce of this duty or excise, if fairly collected, would be in some colonies greater, in others less, as the colonies are greater or smaller. When the collector's accounts are brought in, the proportions will appear; and from them it is proposed to regulate the proportion of representatives to be chosen at the next general election, within the limits, however, of seven and two. These numbers may therefore vary in the course of years, as the colonies may in the growth and increase of people. And thus the quota of tax from each colony would naturally vary with its circumstances, thereby preventing all disputes and dissatisfaction about the just proportions due from each; which might otherwise produce pernicious consequences, and destroy the harmony and good agreement that ought to subsist between the several parts of the Union.

MEETINGS OF THE GRAND COUNCIL, AND CALL.

That the Grand Council shall meet once in every year, and oftener if occasion require, at such time and

place as they shall adjourn to at the last preceding meeting, or as they shall be called to meet at by the President-General on any emergency, he having first obtained in writing the consent of seven of the members to such call, and sent due and timely notice to the whole.

It was thought, in establishing and governing new colonies or settlements, regulating Indian trade, Indian treaties, &c., there would be every year sufficient business arise to require at least one meeting, and at such meeting many things might be suggested for the benefit of all the colonies. This annual meeting may either be at a time or place certain, to be fixed by the President-General and Grand Council at their first meeting; or left at liberty, to be at such time and place as they shall adjourn to, or be called to meet at by the President-General.

In time of war it seems convenient that the meeting should be in that colony which is nearest the seat of action.

The power of calling them on any emergency seemed necessary to be vested in the President-General; but that such power might not be wantonly used to harass the members, and oblige them to make frequent long journeys to little purpose, the consent of seven at least to such call was supposed a convenient guard.

CONTINUANCE.

That the Grand Council have power to choose their speaker, and shall neither be dissolved, prorogued, nor continued sitting longer than six weeks at one time, without their own consent or the special command of the crown.

The speaker should be presented for approbation ; it being convenient, to prevent misunderstandings and disgusts, that the mouth of the Council should be a person agreeable, if possible, both to the Council and President-General.

Governors have sometimes wantonly exercised the power of proroguing or continuing the sessions of assemblies merely to harass the members and compel a compliance ; and sometimes dissolve them on slight disgusts. This it was feared might be done by the President-General, if not provided against, and the inconvenience and hardship would be greater in the general government than in particular colonies, in proportion to the distance the members must be from home during sittings, and the long journeys some of them must necessarily take.

MEMBERS' ALLOWANCE.

That the members of the Grand Council shall be allowed for their service ten shillings sterling per diem during their session and journey to and from the place of meeting ; twenty miles to be reckoned a day's journey.

It was thought proper to allow *some* wages, lest the expense might deter some suitable persons from the service ; and not to allow *too great* wages, lest unsuitable persons should be tempted to cabal for the employment, for the sake of gain. Twenty miles were set down as a day's journey, to allow for accidental hindrances on the road and the greater expenses of travelling than residing at the place of meeting.

ASSENT OF PRESIDENT-GENERAL AND HIS DUTY.

That the assent of the President-General be requisite to all acts of the Grand Council, and that it be his office and duty to cause them to be carried into execution.

The assent of the President-General to all acts of the Grand Council was made necessary, in order to give the crown its due share of influence in this government, and connect it with that of Great Britain. The President-General, besides one half of the legislative power, hath in his hands the whole executive power.

POWER OF PRESIDENT-GENERAL AND GRAND COUNCIL ;
TREATIES OF PEACE AND WAR.

That the President-General, with the advice of the Grand Council, hold or direct all Indian treaties in which the general interest of the colonies may be concerned ; and make peace or declare war with Indian nations.

The power of making peace or war with Indian nations is at present supposed to be in every colony, and is expressly granted to some by charter, so that no new power is hereby intended to be granted to the colonies. But as, in consequence of this power, one colony might make peace with a nation that another was justly engaged in war with, or make war on slight occasions without the concurrence or approbation of neighbouring colonies greatly endangered by it, or make particular treaties of neutrality, in case of a general war, to their own private advantage in trade, by supplying the common enemy,—of all which there

have been instances,—it was thought better to have all treaties of a general nature under a general direction, that so the good of the whole may be consulted and provided for.

INDIAN TRADE.

That they make such laws as they judge necessary for regulating all Indian trade.

Many quarrels and wars have arisen between the colonies and Indian nations through the bad conduct of traders, who cheat the Indians after making them drunk, &c., to the great expense of the colonies, both in blood and treasure. Particular colonies are so interested in the trade, as not to be willing to admit such a regulation as might be best for the whole ; and therefore it was thought best under a general direction.

INDIAN PURCHASES.

That they make all purchases, from Indians for the crown, of lands not now within the bounds of particular colonies, or that shall not be within their bounds when some of them are reduced to more convenient dimensions.

Purchases from the Indians, made by private persons, have been attended with many inconveniences. They have frequently interfered and occasioned uncertainty of titles, many disputes and expensive law-suits, and hindered the settlement of the land so disputed. Then the Indians have been cheated by such private purchases, and discontent and wars have been the consequence. These would be prevented by public, fair purchases.

Several of the colony charters in America extend their bounds to the South Sea, which may be perhaps, three or four thousand miles in length to one or two hundred miles in breadth. It is supposed they must in time be reduced to dimensions more convenient for the common purposes of government.

Very little of the land in those grants is yet purchased of the Indians.

It is much cheaper to purchase of them, than to take and maintain the possession by force; for they are generally very reasonable in their demands for land; and the expense of guarding a large frontier against their incursions is vastly great; because all must be guarded, and always guarded, as we know not where or when *to expect them*.¹

NEW SETTLEMENTS.

That they make new settlements on such purchases, by granting lands in the King's name, reserving a quit-rent to the crown for the use of the general treasury.

It is supposed better that there should be one purchaser than many; and that the crown should be that purchaser, or the Union in the name of the crown. By this means the bargains may be more easily made,

¹ To guard against the incursions of the Indians, a plan was sent over to America (and, as I think, by authority), suggesting the expediency of clearing away the woods and bushes from a tract of land, a mile in breadth, and extending along the back of the colonies. Unfortunately, besides the large expense of the undertaking (which, if one acre cost £2 sterling, and six hundred and forty acres make a square mile, is £128,000 *first cost* for every hundred miles), it was for-

gotten that the Indians, like other people, knew the difference between day and night, and that a mile of advance and another of retreat were nothing to the celerity of such an enemy. This plan, it is said, was the work of Dean Tucker.—B. V.

If the absurdity of such a scheme is not in itself sufficiently glaring, it may be added, that bushes would soon start up and grow into trees again, and the expense of clearing must be often repeated.

the price not enhanced by numerous bidders, future disputes about private Indian purchases, and monopolies of vast tracts to particular persons (which are prejudicial to the settlement and peopling of the country), prevented; and the land being again granted in small tracts to the settlers, the quit-rents reserved may in time become a fund for support of government, for defence of the country, ease of taxes, &c.

Strong forts on the Lakes, the Ohio, &c., may, at the same time they secure our present frontiers, serve to defend new colonies settled under their protection; and such colonies would also mutually defend and support such forts, and better secure the friendship of the far Indians.

A particular colony has scarce strength enough to extend itself by new settlements, at so great a distance from the old; but the joint force of the Union might suddenly establish a new colony or two in those parts, or extend an old colony to particular passes, greatly to the security of our present frontiers, increase of trade and people, breaking off the French communication between Canada and Louisiana, and speedy settlement of the intermediate lands.

The power of settling new colonies is, therefore, thought a valuable part of the plan, and what cannot so well be executed by two unions as by one.

LAWS TO GOVERN THEM.

That they make laws for regulating and governing such new settlements till the crown shall think fit to form them into particular governments.

The making of laws suitable for the new colonies, it was thought, would be properly vested in the President-General and Grand Council, under whose protection they must at first necessarily be, and who would be well acquainted with their circumstances, as having settled them. When they are become sufficiently populous, they may by the crown be formed into complete and distinct governments.

The appointment of a sub-president by the crown, to take place in case of the death or absence of the President-General, would perhaps be an improvement of the plan ; and if all the governors of particular provinces were to be formed into a standing council of state, for the advice and assistance of the President-General, it might be another considerable improvement.

RAISE SOLDIERS AND EQUIP VESSELS, &C.

That they raise and pay soldiers and build forts for the defence of any of the colonies, and equip vessels of force to guard the coasts and protect the trade on the ocean, lakes, or great rivers ; but they shall not impress men in any colony without the consent of the legislature.

It was thought that quotas of men, to be raised and paid by the several colonies, and joined for any public service, could not always be got together with the necessary expedition. For instance, suppose one thousand men should be wanted in New Hampshire on any emergency. To fetch them by fifties and hundreds out of every colony, as far as South Carolina, would be inconvenient, the transportation chargeable, and the occasion perhaps passed before they

could be assembled ; and therefore that it would be best to raise them (by offering bounty-money and pay) near the place where they would be wanted, to be discharged again when the service should be over.

Particular colonies are at present backward to build forts at their own expense, which they say will be equally useful to their neighbouring colonies, who refuse to join, on a presumption that such forts *will* be built and kept up, though they contribute nothing. This unjust conduct weakens the whole ; but the forts being for the good of the whole, it was thought best they should be built and maintained by the whole out of the common treasury.

In the time of war, small vessels of force are sometimes necessary in the colonies to scour the coasts of small privateers. These being provided by the Union will be an advantage in turn to the colonies which are situated on the sea, and whose frontiers on the land-side, being covered by other colonies, reap but little immediate benefit from the advanced forts.

POWER TO MAKE LAWS, LAY DUTIES, &C.

That for these purposes they have power to make laws, and lay and levy such general duties, imposts, or taxes as to them shall appear most equal and just (considering the ability and other circumstances of the inhabitants in the several colonies), and such as may be collected with the least inconvenience to the people ; rather discouraging luxury than loading industry with unnecessary burthens.

The laws which the President-General and Grand

Council are empowered to make *are such only* as shall be necessary for the government of the settlements ; the raising, regulating, and paying soldiers for the general service ; the regulating of Indian trade, and laying and collecting the general duties and taxes. They should also have a power to restrain the exportation of provisions to the enemy from any of the colonies, on particular occasions, in time of war. But it is not intended that they may interfere with the constitution and government of the particular colonies, who are to be left to their own laws, and to lay, levy, and apply their own taxes as before.

GENERAL TREASURER AND PARTICULAR TREASURER.

That they may appoint a General Treasurer and Particular Treasurer in each government, when necessary ; and from time to time may order the sums in the treasuries of each government into the general treasury, or draw on them for special payments, as they find most convenient.

The treasurers here meant are only for the general funds, and not for the particular funds of each colony, which remain in the hands of their own treasurers at their own disposal.

MONEY, HOW TO ISSUE.

Yet no money to issue but by joint orders of the President-General and Grand Council ; except where sums have been appropriated to particular purposes, and the President-General is previously empowered by an act to draw such sums.

J To prevent misapplication of the money, or even application that might be dissatisfactory to the crown or the people, it was thought necessary to join the President-General and Grand Council in all issues of money.

ACCOUNTS.

That the general accounts shall be yearly settled and reported to the several Assemblies.

By communicating the accounts yearly to each Assembly, they will be satisfied of the prudent and honest conduct of their representatives in the Grand Council.

QUORUM.

That a quorum of the Grand Council, empowered to act with the President-General, do consist of twenty-five members, among whom there shall be one or more from a majority of the colonies.

The quorum seems large, but it was thought it would not be satisfactory to the colonies in general to have matters of importance to the whole transacted by a smaller number, or even by this number of twenty-five, unless there were among them one at least from a majority of the colonies; because otherwise, the whole quorum being made up of members from three or four colonies at one end of the union, something might be done that would not be equal with respect to the rest, and thence dissatisfaction and discords might rise to the prejudice of the whole.

LAWS TO BE TRANSMITTED.

That the laws made by them for the purposes aforesaid shall not be repugnant, but, as near as may be,

agreeable to the laws of England, and shall be transmitted to the King in Council for approbation as soon as may be after their passing ; and if not disapproved within three years after presentation, to remain in force.

This was thought necessary for the satisfaction of the crown, to preserve the connexion of the parts of the British empire with the whole, of the members with the head, and to induce greater care and circumspection in making of the laws, that they be good in themselves and for the general benefit.

DEATH OF THE PRESIDENT-GENERAL.

That in case of the death of the President-General, the Speaker of the Grand Council for the time being shall succeed, and be vested with the same powers and authorities, to continue till the King's pleasure be known.

It might be better, perhaps, as was said before, if the crown appointed a vice-president, to take place on the death or absence of the President-General ; for so we should be more sure of a suitable person at the head of the colonies. On the death or absence of both, the speaker to take place (or rather the eldest King's governor) till his Majesty's pleasure be known.

OFFICERS, HOW APPOINTED.

That all military commission officers, whether for land or sea service, to act under this general constitution, shall be nominated by the President-General ; but the approbation of the Grand Council is to be obtained before they receive their commissions. And all civil officers are to be nominated by the Grand Council, and to

receive the President-General's approbation before they officiate.

It was thought it might be very prejudicial to the service to have officers appointed unknown to the people, or unacceptable ; the generality of Americans serving willingly under officers they know, and not caring to engage in the service under strangers, or such as are often appointed by governors through favor or interest. The service here meant is not the stated, settled service in standing troops, but any sudden and short service, either for defence of our colonies or invading the enemy's country (such as the expedition to Cape Breton in the last war, in which many substantial farmers and tradesmen engaged as common soldiers, under officers of their own country, for whom they had an esteem and affection, who would not have engaged in a standing army or under officers from England). It was therefore thought best to give the Council the power of approving the officers, which the people will look upon as a great security of their being good men. And without some such provision as this, it was thought the expense of engaging men in the service on any emergency would be much greater, and the number who could be induced to engage much less, and that therefore it would be most for the King's service and general benefit of the nation that the prerogative should relax a little in this particular throughout all the colonies in America, as it had already done much more in the charters of some particular colonies, viz., Connecticut and Rhode Island.

The civil officers will be chiefly treasurers and col-

lectors of taxes ; and the suitable persons are most likely to be known by the Council.

VACANCIES, HOW SUPPLIED.

But in case of vacancy by death or removal of any officer, civil or military, under this constitution, the Governor of the province in which such vacancy happens may appoint, till the pleasure of the President-General and Grand Council can be known.

The vacancies were thought best supplied by the governors in each province, till a new appointment can be regularly made ; otherwise the service might suffer before the meeting of the President-General and Grand Council.

EACH COLONY MAY DEFEND ITSELF ON EMERGENCY, &c.

That the particular military as well as civil establishments in each colony remain in their present state, the general constitution notwithstanding ; and that on sudden emergencies any colony may defend itself, and lay the accounts of expense thence arising before the President-General and General Council, who may allow and order payment of the same, as far as they judge such accounts just and reasonable.

Otherwise the union of the whole would weaken the parts, contrary to the design of the Union. The accounts are to be judged of by the President-General and Grand Council, and allowed if found reasonable. This was thought necessary to encourage colonies to defend themselves, as the expense would be light when borne by the whole ; and also to check imprudent and lavish expense in such defences.

CXIII.

THREE LETTERS TO GOVERNOR SHIRLEY.

LETTER I.¹

CONCERNING THE VOICE OF THE PEOPLE IN CHOOSING THE RULERS
BY WHOM TAXES ARE IMPOSED.

Tuesday Morning [December 17, 1754].

SIR :—I return you the loose sheets of the plan, with thanks to your Excellency for communicating them.

I apprehend, that excluding the people of the colonies from all share in the choice of the grand council will give extreme dissatisfaction, as well as the taxing

¹ It is stated by Mr. Benjamin Vaughan, that these letters first appeared in the *London Chronicle* for February 6 and 8, 1766, with prefatory remarks signed "A LOVER OF BRITAIN."

"The Albany Plan of Union," says this writer, "was sent to the government here for approbation. Had it been approved and established by the authority from hence, English America thought itself sufficiently able to cope with the French, without other assistance; several of the colonies having alone, in former wars, withstood the whole power of the enemy, unassisted not only by the mother country, but by any of the neighboring provinces. The plan, however, was not approved here; but a *new one* was formed instead of it; by which it was proposed, that 'the governors of all the colonies, attended by one or two members of their respective councils, should assemble, and concert measures for the defence of the whole, erect forts where they judged proper, and raise what troops they thought necessary, with power to draw on the treasury here for the sums that should be wanted, and the treasury to be reimbursed by a *tax laid on the colonies by act of Parliament.*'—This *new plan*, being com-

municated by Governor Shirley to a gentleman of Philadelphia (Dr. Franklin) then in Boston (who has very eminently distinguished himself, before and since that time, in the literary world, and whose judgment, penetration, and candor, as well as his readiness and ability to suggest, forward, or carry into execution, every scheme of public utility, hath most deservedly endeared him, not only to our fellow-subjects throughout the continent of North America, but to his numberless friends on this side the Atlantic), occasioned the following remarks from him, which perhaps may contribute in some degree to its being laid aside. As they very particularly show the then sentiments of the Americans on the subject of a parliamentary tax, before the French power in that country was subjected, and before the late restraints on their commerce, they satisfy me, and I hope they will convince your readers, contrary to what has been advanced by some of your correspondents, that those particulars have had no share in producing the present opposition to such a tax, nor in disturbances occasioned by it, which these papers indeed do almost prophetically foretell."

them by act of Parliament, where they have no representation. It is very possible that this general government might be as well and faithfully administered without the people as with them ; but where heavy burthens are to be laid upon them, it has been found useful to make it as much as possible their own act ; for they bear better, when they have, or think they have, some share in the direction ; and when any public measures are generally grievous, or even distasteful, to the people, the wheels of government move more heavily.

LETTER II.

ON THE IMPOSITION OF DIRECT TAXES UPON THE COLONIES WITHOUT THEIR CONSENT.

Wednesday Morning [December 18, 1754].

SIR :—I mentioned it yesterday to your Excellency as my opinion, that excluding the people of the colonies from all share in the choice of the grand council would probably give extreme dissatisfaction, as well as the taxing them by act of Parliament, where they have no representation. In matters of general concern to the people, and especially where burthens are to be laid upon them, it is of use to consider, as well what they will be apt to think and say, as what they ought to think. I shall therefore, as your Excellency requires it of me, briefly mention what of either kind occurs to me on this occasion.

First, they will say, and perhaps with justice, that the body of the people in the colonies are as loyal, and as firmly attached to the present constitution and

reigning family, as any subjects in the King's dominions.

That there is no reason to doubt the readiness and willingness of the representatives they may choose to grant from time to time such supplies for the defence of the country as shall be judged necessary, so far as their abilities will allow.

That the people in the colonies who are to feel the immediate mischiefs of invasion and conquest by an enemy, in the loss of their estates, lives, and liberties, are likely to be better judges of the quantity of forces necessary to be raised and maintained, forts to be built and supported, and of their own abilities to bear the expense, than the Parliament of England, at so great a distance.

That governors often come to the colonies merely to make fortunes, with which they intend to return to Britain ; are not always men of the best ability and integrity ; have many of them no estates here, nor any natural connexion with us that should make them heartily concerned for our welfare ; and might possibly be fond of raising and keeping up more forces than necessary, from the profits accruing to themselves, and to make provision for their friends and dependents.

That the counsellors in most of the colonies being appointed by the crown, on the recommendation of governors, are often persons of small estates, frequently dependent on the governors for office, and therefore too much under influence.

That there is therefore great reason to be jealous of a power in such governors and councils to raise

such sums as they shall judge necessary, by drafts on the Lords of the Treasury, to be afterwards laid on the colonies by act of Parliament, and paid by the people here; since they might abuse it by projecting useless expeditions, harassing the people, and taking them from their labor to execute such projects, merely to create offices and employments, and gratify their dependents, and divide profits.

That the Parliament of England is at a great distance, subject to be misinformed and misled by such governors and councils, whose united interests might possibly secure them against the effect of any complaint from hence.

That it is supposed an undoubted right of Englishmen not to be taxed but by their own consent, given through their representatives.

That the colonies have no representatives in Parliament.

That to propose taxing them by Parliament, and refuse them the liberty of choosing a representative council to meet in the colonies, and consider and judge of the necessity of any general tax and the quantum, shows a suspicion of their loyalty to the crown, or of their regard for their country, or of their common sense and understanding, which they have not deserved.

That compelling the colonies to pay money without their consent, would be rather like raising contributions in an enemy's country, than taxing of Englishmen for their own public benefit.

That it would be treating them as a conquered people, and not as true British subjects.

✓ That a tax laid by the representatives of the colonies might be easily lessened as the occasions should lessen ; but being once laid by Parliament, under the influence of the representations made by governors, would probably be kept up and continued for the benefit of governors, to the grievous burthen and discontent of the colonies, and prevention of their growth and increase.

That a power in governors to march the inhabitants from one end of the British and French colonies to the other, being a country of at least one thousand five hundred miles long, without the approbation or the consent of their representatives first obtained to such expeditions, might be grievous and ruinous to the people, and would put them upon a footing with the subjects of France in Canada, that now groan under such oppression from their governor, who for two years past has harassed them with long and destructive marches to Ohio.

That if the colonies in a body may be well governed by governors and councils appointed by the crown, without representatives, particular colonies may as well or better be so governed ; a tax may be laid upon them all by act of Parliament for support of government, and their Assemblies may be dismissed as an useless part of the constitution.

That the powers, proposed by the Albany Plan of Union to be vested in a grand council representative of the people, even with regard to military matters, are not so great as those which the colonies of Rhode Island and Connecticut are intrusted with by their

charters, and have never abused ; for, by this plan, the president-general is appointed by the crown, and controls all by his negative ; but in those governments the people choose the governor, and yet allow him no negative.

That the British colonies bordering on the French are properly frontiers of the British empire ; and the frontiers of an empire are properly defended at the joint expense of the body of the people in such empire. It would now be thought hard by act of Parliament to oblige the Cinque Ports or sea-coasts of Britain to maintain the whole navy, because they are more immediately defended by it, not allowing them at the same time a vote in choosing members of the Parliament ; and as the frontiers of America bear the expense of their own defence, it seems hard to allow them no share in voting the money, judging of the necessity and sum, or advising the measures.

That, besides the taxes necessary for the defence of the frontiers, the colonies pay yearly great sums to the mother country unnoticed ; for

1. Taxes paid in Britain by the landholder or artificer must enter into and increase the price of the produce of land and manufactures made of it ; and great part of this is paid by consumers in the colonies, who thereby pay a considerable part of the British taxes.

2. We are restrained in our trade with foreign nations ; and where we could be supplied with any manufacture cheaper from them, but must buy the same dearer from Britain, the difference of price is a clear tax to Britain.

3. We are obliged to carry a great part of our produce directly to Britain ; and where the duties laid upon it lessen its price to the planter, or it sells for less than it would in foreign markets, the difference is a tax paid to Britain.

4. Some manufactures we could make, but are forbidden, and must take them of British merchants ; the whole price is a tax paid to Britain.

5. By our greatly increasing the demand and consumption of British manufactures, their price is considerably raised of late years ; the advantage is clear profit to Britain, and enables its people better to pay great taxes ; and much of it being paid by us, is clear tax to Britain.

6. In short, as we are not suffered to regulate our trade and restrain the importation and consumption of British superfluities, as Britain can the consumption of foreign superfluities, our whole wealth centres finally amongst the merchants and inhabitants of Britain ; and if we make them richer, and enable them better to pay their taxes, it is nearly the same as being taxed ourselves, and equally beneficial to the crown.

These kinds of secondary taxes, however, we do not complain of, though we have no share in the laying or disposing of them ; but to pay immediate heavy taxes, in the laying, appropriation, and disposition of which we have no part, and which perhaps we may know to be as unnecessary as grievous, must seem hard measures to Englishmen, who cannot conceive that by hazarding their lives and fortunes in subduing and settling new countries, extending the dominion

and increasing the commerce of the mother nation, they have forfeited the native rights of Britons, which they think ought rather to be given to them, as due to such merit, if they had been before in a state of slavery.

These, and such kinds of things as these, I apprehend will be thought and said by the people, if the proposed alteration of the Albany plan should take place. Then the administration of the board of governors and council so appointed, not having the representative body of the people to approve and unite in its measures, and conciliate the minds of the people to them, will probably become suspected and odious, dangerous animosities and feuds will arise between the governors and governed, and every thing go into confusion.

Perhaps I am too apprehensive in this matter; but having freely given my opinion and reasons, your Excellency can judge better than I whether there be any weight in them; and the shortness of the time allowed me will, I hope, in some degree excuse the imperfections of this scrawl.

With the greatest respect and fidelity, I have the honor to be

Your Excellency's most obedient
and most humble servant,

B. FRANKLIN.¹

¹ Respecting this letter, Mr. John Adams said (in his "History of the Dispute with America," first published in 1774): "Dr. Franklin, who was known to be an active and very able man, and to have great influence in the province of Pennsylvania, was in Boston in the year 1754, and Mr. Shirley communicated to him the pro-

found secret, the great design of taxing the colonies by act of Parliament. This sagacious gentleman and distinguished patriot, to his lasting honor, sent the governor an answer in writing, with the following remarks on his scheme:" Mr. Adams then quotes the principal parts of the above letter. —EDITOR.

LETTER III.

ON THE SUBJECT OF UNITING THE COLONIES MORE INTIMATELY
WITH GREAT BRITAIN, BY ALLOWING THEM REPRESENTATIVES
IN PARLIAMENT.

BOSTON, December 22, 1754.

SIR :—Since the conversation your Excellency was pleased to honor me with, on the subject of *uniting the colonies* more intimately with Great Britain, by allowing them *representatives in Parliament*, I have something further considered that matter, and am of opinion that such a union would be very acceptable to the colonies, provided they had a reasonable number of representatives allowed them ; and that all the old acts of Parliament restraining the trade or cramping the manufactures of the colonies be at the same time repealed, and the British subjects *on this side the water* put, in those respects, on the same footing with those in Great Britain, till the new Parliament, representing the whole, shall think it for the interest of the whole to re-enact some or all of them. It is not that I imagine so many representatives will be allowed the colonies as to have any great weight by their numbers, but I think there might be sufficient to occasion those laws to be better and more impartially considered, and perhaps to overcome the interest of a petty corporation, or of any particular set of artificers or traders in England, who heretofore seem, in some instances, to have been more regarded than all the colonies, or than was consistent with the general interest or best national good. I think, too, that the government of the colonies by a Parliament in which they are fairly represented, would be vastly

more agreeable to the people than the method lately attempted to be introduced by royal instruction, as well as more agreeable to the nature of an English constitution and to English liberty; and that such laws as now seem to bear hard on the colonies, would (when judged by such a Parliament for the best interest of the whole) be more cheerfully submitted to and more easily executed.

I should hope, too, that by such a union the people of Great Britain and the people of the colonies would learn to consider themselves as not belonging to different communities with different interests, but to one community with one interest; which I imagine would contribute to strengthen the whole, and greatly lessen the danger of future separations.

It is, I suppose, agreed to be the general interest of any state, that its people be numerous and rich; men enow to fight in its defence, and enow to pay sufficient taxes to defray the charge; for these circumstances tend to the security of the state and its protection from foreign power. But it seems not of so much importance whether the fighting be done by John or Thomas, or the tax paid by William or Charles. The iron manufacture employs and enriches British subjects, but is it of any importance to the state whether the manufacturer lives at Birmingham, or Sheffield, or both, since they are still within its bounds, and their wealth and persons still at its command? Could the Goodwin Sands be laid dry by banks, and land equal to a large country

thereby gained to England, and presently filled with English inhabitants, would it be right to deprive such inhabitants of the common privileges enjoyed by other Englishmen,—the right of vending their produce in the same ports, or of making their own shoes, because a merchant or a shoemaker living on the old land might fancy it more for his advantage to trade or make shoes for them? Would this be right even if the land were gained at the expense of the state? And would it not seem less right if the charge and labor of gaining the additional territory to Britain had been borne by the settlers themselves? And would not the hardship appear yet greater if the people of the new country should be allowed no representatives in the Parliament enacting such impositions?

Now, I look on the colonies as so many countries gained to Great Britain, and more advantageous to it than if they had been gained out of the seas around its coasts and joined to its lands; for, being in different climates, they afford greater variety of produce and materials for more manufactures, and being separated by the ocean, they increase much more its shipping and seamen; and since they are all included in the British empire, which has only extended itself by their means, and the strength and wealth of the parts are the strength and wealth of the whole, what imports it to the general state whether a merchant, a smith, or a hatter grows rich in Old or New England? And if, through increase of the people, two smiths are wanted for one employed before, why may

not the *new* smith be allowed to live and thrive in the *new* country, as well as the *old* one in the *old*? In fine, why should the countenance of a state be *partially* afforded to its people, unless it be most in favor of those who have most merit? And if there be any difference, those who have most contributed to enlarge Britain's empire and commerce, increase her strength, her wealth, and the numbers of her people, at the risk of their own lives and private fortunes in new and strange countries, methinks ought rather to expect some preference. With the greatest respect and esteem, I have the honor to be

Your Excellency's most obedient

and humble servant,

B. FRANKLIN.

CXIV.

TO MISS CATHERINE RAY, AT BLOCK ISLAND.

PHILADELPHIA, 4 March, 1755.

DEAR KATY :—Your kind letter of January 20th is but just come to hand, and I take this first opportunity of acknowledging the favor. It gives me great pleasure to hear that you got home safe and well that day. I thought too much was hazarded, when I saw you put off to sea in that very little skiff, tossed by every wave. But the call was strong and just—a sick parent. I stood on the shore and looked after you till I could no longer distinguish you even with my glass; then returned to your sister's, praying for your safe passage. Towards evening all agreed that you must certainly be arrived before that time, the weather

having been so favorable, which made me more easy and cheerful, for I had been truly concerned for you.

I left New England slowly, and with great reluctance. Short day's journeys, and loitering visits on the road, for three or four weeks, manifested my unwillingness to quit a country in which I drew my first breath, spent my earliest and most pleasant days, and had now received so many fresh marks of the people's goodness and benevolence, in the kind and affectionate treatment I had everywhere met with. I almost forgot I had a *home*, till I was more than half way towards it ; till I had, one by one, parted with all my New England friends, and was got into the western borders of Connecticut, among mere strangers. Then, like an old man, who, having buried all he loved in this world, begins to think of heaven, I began to think of and wish for home ; and as I drew nearer, I found the attraction stronger and stronger. My diligence and speed increased with my impatience. I drove on violently, and made such long stretches, that a very few days brought me to my own house, and to the arms of my good old wife and children, where I remain, thanks to God, at present well and happy.

Persons subject to the *hypo* complain of the northeast wind, as increasing their malady. But since you promised to send me kisses in that wind, and I find you as good as your word, it is to me the gayest wind that blows, and gives me the best spirits. I write this during a northeast storm of snow, the greatest we have had this winter. Your favors come mixed with the snowy fleeces, which are pure as your virgin

innocence, white as your lovely bosom, and—as cold. But let it warm towards some worthy young man, and may Heaven bless you both with every kind of happiness.

I desired Miss Anna Ward to send you over a little book I left with her, for your amusement in that lonely island. My respects to your good father, and mother, and sister. Let me often hear of your welfare, since it is not likely I shall ever again have the pleasure of seeing you. Accept mine and my wife's sincere thanks for the many civilities I receive from you and your relations; and do me the justice to believe me, dear girl, your affectionate, faithful friend and humble servant,

B. FRANKLIN.

P. S.—My respectful compliments to your good brother Ward, and sister; and to the agreeable family of the Wards at Newport, when you see them. Adieu.

CXV.

ELECTRICAL EXPERIMENTS

Made in Pursuance of those made by Mr. Canton, dated December 6, 1753; with Explanations, by Benjamin Franklin.

READ AT THE ROYAL SOCIETY, DECEMBER 18, 1755.

PHILADELPHIA, 14 March, 1755.

PRINCIPLES.

I. Electric atmospheres that flow round non-electric bodies, being brought near each other, do not readily mix and unite into one atmosphere, but remain separate and repel each other.

This is plainly seen in suspended cork balls and other bodies electrified.

II. An electric atmosphere not only repels another electric atmosphere, but will also repel the electric matter contained in the substance of a body approaching it, and, without joining or mixing with it, force it to other parts of the body that contained it.

This is shown by some of the following experiments.

III. Bodies electrified negatively, or deprived of their natural quantity of electricity, repel each other (or at least appear to do so by a mutual receding), as well as those electrified positively, or which have electric atmospheres.

This is shown by applying the negatively charged wire of a phial to two cork balls suspended by silk threads, and many other experiments.

Fix a tassel of fifteen or twenty threads, three inches long, at one end of a tin prime conductor (mine is about five feet long and four inches diameter), supported by silk lines.

Let the threads be a little damp, but not wet.

Pass an excited glass tube near the other end of the prime conductor, so as to give it some sparks, and the threads will diverge.

Because each thread, as well as the prime conductor, has acquired an electric atmosphere, which repels and is repelled by the atmospheres of the other threads; if those several atmospheres would readily mix, the threads might unite, and hang in the middle of one atmosphere, common to them all.

Rub the tube afresh, and approach the prime conductor therewith, crosswise, near that end, but not nigh enough to give sparks, and the threads will diverge a little more.

Because the atmosphere of the prime conductor is pressed by the atmosphere of the excited tube, and driven towards the end where the threads are, by which each thread acquires more atmosphere.

Withdraw the tube, and they will close as much.

They close as much, and no more, because the atmosphere of the glass tube, not having mixed with the atmosphere of the prime conductor, is withdrawn entire, having made no addition to or diminution from it.

Bring the excited tube under the tuft of threads, and they will close a little.

They close, because the atmosphere of the glass tube repels their atmospheres, and drives part of them back on the prime conductor.

Withdraw it, and they will diverge as much.

For the portion of atmosphere which they had lost returns to them again.

Excite the glass tube and approach the prime conductor with it, holding it across, near the end opposite to that on which the threads hang, at the distance of five or six inches. Keep it there a few seconds, and the threads of the tassels will diverge. Withdraw it, and they will close.

They diverge, because they have received electric atmospheres from the electric matter before contained in the substance of the prime conductor, but which is now repelled and driven away by the atmos-

phere of the glass tube from the parts of the prime conductor opposite and nearest to that atmosphere, and forced out upon the surface of the prime conductor at its other end, and upon the threads hanging thereto. Were it any part of the atmosphere of the glass tube that flowed over and along the prime conductor to the threads, and gave them atmospheres (as is the case when a spark is given to the prime conductor from the glass tube), such part of the tube's atmosphere would have remained, and the threads continue to diverge; but they close on withdrawing the tube, because the tube takes with it *all its own atmosphere*, and the electric matter, which had been driven out of the substance of the prime conductor, and formed atmospheres round the threads, is thereby permitted to return to its place.

Take a spark from the prime conductor near the threads, when they are diverged as before, and they will close.

For by so doing you take away their atmospheres, composed of the electric matter driven out of the substance of the prime conductor, as aforesaid, by the repellency of the atmosphere of the glass tube. By taking this spark you rob the prime conductor of part of its natural quantity of the electric matter, which part so taken is not supplied by the glass tube, for, when that is afterwards withdrawn, it takes with it its whole atmosphere, and leaves the prime conductor electrized negatively, as appears by the next operation.

Then withdraw the tube, and they will open again.

For now the electric matter in the prime conductor returning to its equilibrium, or equal diffusion, in all parts of its substance, and the prime conductor having lost some of its natural quantity, the threads connected with it lose part of theirs, and so are electrized negatively, and therefore repel each other, by *Principle III.*

Approach the prime conductor with the tube, near the same place as at first, and they will close again.

Because the part of their natural quantity of electric fluid which they had lost is now restored to them again, by the repulsion of the glass tube forcing that fluid to them from other parts of the prime conductor ; so they are now again in their natural state.

Withdraw it, and they will open again.

For what had been restored to them is now taken from them again, flowing back into the prime conductor, and leaving them once more electrized negatively.

Bring the excited tube under the threads, and they will diverge more.

Because more of their natural quantity is driven from them into the prime conductor, and thereby their negative electricity increased.

The prime conductor not being electrified, brings the excited tube under the tassel, and the threads will diverge.

Part of their natural quantity is thereby driven out of them into the prime conductor, and they become negatively electrized, and therefore repel each other.

Keeping the tube in the same place with one hand, attempt to touch the threads with the finger of the other hand, and they will recede from the finger.

Because the finger being plunged into the atmosphere of the glass tube, as well as the threads, part of its natural quantity is driven back through the hand and body by that atmosphere, and the finger becomes, as well as the threads, negatively electrized, and so repels, and is repelled by them. To confirm this, hold a slender, light lock of cotton, two or three inches long, near a prime conductor that is electrified by a glass globe or tube. You will see the cotton stretch itself out towards the prime conductor. Attempt to touch it with the finger of the other hand, and it will be repelled by the finger. Approach it with a positively charged wire of a bottle, and it will fly to the wire. Bring it near a negatively charged wire of a bottle, it will recede from that wire in the same manner that it did from the finger; which demonstrates the finger to be negatively electrized, as well as the lock of cotton so situated.

Turkey killed by Electricity.—Effect of a Shock on the Operator in making the Experiment.

As Mr. Franklin, in a former letter to Mr. Collinson, mentioned his intending to try the power of a very strong electrical shock upon a turkey, that gentleman accordingly has been so very obliging as to send an account of it, which is to the following purpose :

He made first several experiments on fowls, and found that two large, thin glass jars gilt, holding each about six gallons, were sufficient, when fully charged,

to kill common hens outright; but the turkeys, though thrown into violent convulsions, and then lying as dead for some minutes, would recover in less than a quarter of an hour. However, having added three other such to the former two, though not fully charged, he killed a turkey of about ten pounds weight, and believes that they would have killed a much larger. He conceited, as himself says, that the birds killed in this manner eat uncommonly tender.

In making these experiments, he found that a man could, without great detriment, bear a much greater shock than he had imagined; for he inadvertently received the stroke of two of these jars through his arms and body, when they were very near fully charged. It seemed to him a universal blow throughout the body from head to foot, and was followed by a violent, quick trembling in the trunk which went off gradually in a few seconds. It was some minutes before he could recollect his thoughts so as to know what was the matter; for he did not see the flash, though his eye was on the spot of the prime conductor, from whence it struck the back of his hand; nor did he hear the crack, though the by-standers said it was a loud one; nor did he particularly feel the stroke on his hand, though he afterwards found it had raised a swelling there of the bigness of half a pistol-bullet. His arms and the back of the neck felt somewhat numbed the remainder of the evening, and his breast was sore for a week after, as if it had been bruised. From this experiment may be seen the danger, even under the greatest caution, to the oper-

ator, when making these experiments with large jars ; for it is not to be doubted but several of these fully charged would as certainly, by increasing them in proportion to the size, kill a man, as they before did a turkey.

CXVI.

TO JOHN LINING, AT CHARLESTON, SOUTH CAROLINA.

PHILADELPHIA, 18 March, 1755.

SIR :—I send you enclosed a paper containing some new experiments I have made, in pursuance of those by Mr. Canton, that are printed with my last letters. I hope these, with my explanation of them, will afford you some entertainment.¹

In answer to your several inquiries. The tubes and globes we use here are chiefly made here. The glass has a greenish cast, but is clear and hard, and, I think, better for electrical experiments than the white glass of London, which is not so hard. There are certainly great differences in glass. A white globe I had made here some years since, would never, by any means, be excited. Two of my friends tried it, as well as myself, without success. At length, putting it on an electric stand, a chain from the prime conductor being in contact with it, I found it had the properties of a non-electric ; for I could draw sparks from any part of it, though it was very clean and dry.

All I know of Domien is, that by his own account he was a native of Transylvania, of Tartar descent,

¹ See No. CXV.

but a priest of the Greek Church ; he spoke and wrote Latin very readily and correctly. He set out from his own country with an intention of going round the world, as much as possible by land. He travelled through Germany, France, and Holland, to England. Resided some time at Oxford. From England he came to Maryland ; thence went to New England ; returned by land to Philadelphia ; and from hence travelled through Maryland, Virginia, and North Carolina to you. He thought it might be of service to him in his travels to know something of electricity. I taught him the use of the tube, how to charge the Leyden phial, and some other experiments. He wrote to me from Charleston, that he lived eight hundred miles upon electricity ; it had been meat, drink, and clothing to him. His last letter to me was, I think, from Jamaica, desiring me to send the tubes you mention, to meet him at the Havana, from whence he expected to get a passage to La Vera Cruz ; designed travelling over land through Mexico to Acapulco ; thence to get a passage to Manilla, and so through China, India, Persia, and Turkey, home to his own country, proposing to support himself chiefly by electricity. A strange project ! But he was, as you observe, a very singular character. I was sorry the tubes did not get to the Havana in time for him. If they are still in being, please to send for them, and accept of them. What became of him afterwards, I have never heard. He promised to write to me as often as he could on his journey, and as soon as he should get home after finishing his tour. It is now

seven years since he was here. If he is still in New Spain, as you imagine from that loose report, I suppose it must be that they confine him there, and prevent his writing; but I think it more likely that he may be dead.

The questions you ask about the pores of glass, I cannot answer otherwise than that I know nothing of their nature; and suppositions, however ingenious, are often mere mistakes. My hypothesis, that they were smaller near the middle of the glass,—too small to admit the passage of electricity, which could pass through the surface till it came near the middle, was certainly wrong. For soon after I had written that letter, I did, in order to *confirm* the hypothesis (which indeed I ought to have done before I wrote it), make an experiment. I ground away five sixths of the thickness of the glass from the side of one of my phials, expecting that, the supposed denser part being so removed, the electric fluid might come through the remainder of the glass, which I had imagined more open; but I found myself mistaken. The bottle charged as well after the grinding as before. I am now as much as ever at a loss to know how or where the quantity of electric fluid on the positive side of the glass is disposed of.

As to the difference of conductors, there is not only this, that some will conduct electricity in small quantities, and yet do not conduct it fast enough to produce the shock; but even among those that will conduct a shock, there are some that do it better than others. Mr. Kinnersley has found, by a very good

experiment, that when the charge of a bottle hath an opportunity of passing two ways, that is, straight through a trough of water ten feet long and six inches square, or round about through twenty feet of wire, it passes through the wire, and not through the water, though that is the shortest course; the wire being the better conductor. When the wire is taken away, it passes through the water, as may be felt by a hand plunged in the water; but it cannot be felt in the water when the wire is used at the same time. Thus, though a small phial containing water will give a smart shock, one containing the same quantity of mercury will give one much stronger, the mercury being the better conductor; while one containing oil only, will scarce give any shock at all.

Your question, how I came first to think of proposing the experiment of drawing down the lightning in order to ascertain its sameness with the electric fluid, I cannot answer better than by giving you an extract from the minutes I used to keep of the experiments I made, with memorandums of such as I purposed to make, the reasons for making them, and the observations that arose upon them, from which minutes my letters were afterwards drawn. By this extract you will see that the thought was not so much "an out-of-the-way one," but that it might have occurred to an electrician.

"*November 7th, 1749.* Electrical fluid agrees with lightning in these particulars: 1. Giving light. 2. Color of the light. 3. Crooked direction. 4. Swift motion. 5. Being conducted by metals. 6. Crack or

noise in exploding. 7. Subsisting in water or ice. 8. Rending bodies it passes through. 9. Destroying animals. 10. Melting metals. 11. Firing inflammable substances. 12. Sulphureous smell. The electric fluid is attracted by points. We do not know whether this property is in lightning. But since they agree in all the particulars wherein we can already compare them, is it not probable they agree likewise in this? Let the experiment be made."

I wish I could give you any satisfaction in the article of clouds. I am still at a loss about the manner in which they become charged with electricity; no hypothesis I have yet formed perfectly satisfying me. Some time since, I heated very hot a brass plate, two feet square, and placed it on an electric stand. From the plate a wire extended horizontally four or five feet, and, at the end of it, hung, by linen threads, a pair of cork balls. I then repeatedly sprinkled water over the plate, that it might be raised from it in vapor, hoping, that, if the vapor either carried off the electricity of the plate, or left behind it that of the water (one of which I supposed it must do, if, like the clouds, it became electrized itself, either positively or negatively), I should perceive and determine it by the separation of the balls, and by finding whether they were positive or negative; but no alteration was made at all, nor could I perceive that the steam was itself electrized, though I have still some suspicion that the steam was not fully examined, and I think the experiment should be repeated. Whether the first state of electrized clouds is positive or negative,

if I could find the cause of that, I should be at no loss about the other ; for either is easily deduced from the other, as one state is easily produced by the other. A strongly positive cloud may drive out of a neighbouring cloud much of its natural quantity of the electric fluid, and, passing by it, leave it in a negative state. In the same way, a strongly negative cloud may occasion a neighbouring cloud to draw into itself from others an additional quantity, and, passing by it, leave it in a positive state. How these effects may be produced, you will easily conceive, on perusing and considering the experiments in the enclosed paper ; and from them too it appears probable, that every change from positive to negative, and from negative to positive, that, during a thunder-gust, we see in the cork balls annexed to the apparatus, is not owing to the presence of clouds in the same state, but often to the absence of positive or negative clouds, that, having just passed, leave the rod in the opposite state.

The knocking down of the six men was performed with two of my large jars not fully charged. I laid one end of my discharging-rod upon the head of the first ; he laid his hand on the head of the second ; the second his hand on the head of the third, and so to the last, who held in his hand the chain that was connected with the outside of the jars. When they were thus placed, I applied the other end of my rod to the prime conductor, and they all dropped together. When they got up, they all declared they had not felt any stroke, and wondered how they came

to fall ; nor did any of them either hear the crack, or see the light of it. You suppose it a dangerous experiment ; but I had once suffered the same myself, receiving, by accident, an equal stroke through my head, that struck me down, without hurting me. And I had seen a young woman, that was about to be electrified through the feet (for some indisposition), receive a greater charge through the head, by inadvertently stooping forward to look at the placing of her feet, till her forehead (as she was very tall) came too near my prime conductor ; she dropped, but instantly got up again, complaining of nothing. A person so struck, sinks down doubled, or folded together, as it were, the joints losing their strength and stiffness at once, so that he drops on the spot where he stood, instantly, and there is no previous staggering, nor does he ever fall lengthwise. Too great a charge might, indeed, kill a man, but I have not yet seen any hurt done by it. It would certainly, as you observe, be the easiest of all deaths.

The experiment you have heard so imperfect an account of, is merely this : I electrified a silver pint can, on an electric stand, and then lowered into it a cork ball, of about an inch diameter, hanging by a silk string, till the cork touched the bottom of the can. The cork was not attracted to the inside of the can, as it would have been to the outside ; and, though it touched the bottom, yet, when drawn out, it was not found to be electrified by that touch, as it would have been by touching the outside. The fact is singular. You require the reason ; I do not know it. Perhaps you may discover it, and then you will be so

good as to communicate it to me.¹ I find a frank acknowledgment of one's ignorance is, not only the easiest way to get rid of a difficulty, but the likeliest way to obtain information, and therefore I practise it; I think it an honest policy. Those who affect to be thought to know every thing, and so undertake to explain every thing, often remain long ignorant of many things that others could and would instruct them in, if they appeared less conceited.

The treatment your friend has met with is so common, that no man, who knows what the world is and ever has been, should expect to escape it. There are everywhere a number of people, who, being totally destitute of any inventive faculty themselves, do not readily conceive that others may possess it; they think of inventions as of miracles; there might be such formerly, but they are ceased. With these, every one who offers a new invention is deemed a pretender; he had it from some other country, or from some book; a man of *their own acquaintance*, one who has no more sense than themselves, could not possibly, in their opinion, have been the inventor of any thing. They are confirmed, too, in these sentiments, by frequent instances of pretensions to invention, which vanity is daily producing. That vanity, too, though an incitement to invention, is, at the same time, the pest of inventors. Jealousy and envy deny the merit or the novelty of your invention; but vanity, when the novelty and merit are established, claims it for its

¹ Mr. Franklin has since thought, that possibly the mutual repulsion of the inner opposite sides of the electrical can may prevent the accumulating

an electric atmosphere upon them, and occasion it to stand chiefly on the outside; but recommends it to the farther examination of the curious.

own. The smaller your invention is, the more mortification you receive in having the credit of it disputed with you by a rival, whom the jealousy and envy of others are ready to support against you, at least so far as to make the point doubtful. It is not in itself of importance enough for a dispute; no one would think your proofs and reasons worth their attention; and yet, if you do not dispute the point, and demonstrate your right, you not only lose the credit of being in that instance *ingenious*, but you suffer the disgrace of not being *ingenuous*; not only of being a plagiarist, but of being plagiarist for trifles. Had the invention been greater, it would have disgraced you less; for men have not so contemptible an idea of him that robs for gold on the highway, as of him that can pick pockets for half-pence and farthings. Thus, through envy, jealousy, and the vanity of competitors for fame, the origin of many of the most extraordinary inventions, though produced within but a few centuries past, is involved in doubt and uncertainty. We scarce know to whom we are indebted for the *compass*, and *spectacles*, nor have even *paper* and *printing*, that record every thing else, been able to preserve with certainty the name and reputation of their inventors. One would not, therefore, of all faculties or qualities of the mind, wish, for a friend or a child, that he should have that of invention. For his attempts to benefit mankind in that way, however well imagined, if they do not succeed, expose him, though very unjustly, to general ridicule and contempt; and, if they do succeed, to envy, robbery, and abuse.

I am, &c., B. FRANKLIN.

CXVII.

TO M. DALIBARD, AT PARIS, ENCLOSED IN A LETTER TO
PETER COLLINSON.

READ AT THE ROYAL SOCIETY, DECEMBER 18, 1755.

PHILADELPHIA, 29 June, 1755.

SIR:—You desire my opinion of Pèrè Beccaria's Italian book.¹ I have read it with much pleasure, and think it one of the best pieces on the subject that I have seen in any language. Yet, as to the article of *Water-spouts*, I am not at present of his sentiments; though I must own, with you, that he has handled it very ingeniously. Mr. Collinson has my opinion of whirlwinds and water-spouts at large, written some time since. I know not whether they will be published; if not, I will get them transcribed for your perusal.² It does not appear to me that Pèrè Beccaria doubts of the *absolute impermeability of glass* in the sense I mean it; for the instances he gives of holes made through glass, by the electric stroke, are such as we have all experienced, and only show that the electric fluid could not pass without making a hole. In the same manner we say glass is impermeable to water, and yet a stream from a fire-engine will force through the strongest panes of a window. As to the effect of points in drawing the

¹ This work is written, conformably to Mr. Franklin's theory, upon artificial and natural electricity, which compose the two parts of it. It was printed in Italian, at Turin, in quarto, 1753; between the two parts is a letter to the Abbé Nollet, in defence of Mr. Franklin's system.—J. BEVIS.

² Beccaria wrote a long letter to Franklin, dated at Turin, December 24, 1757, giving an account of several experiments made by him in electricity, illustrative of Franklin's principles. The letter, written in Latin, is contained in the "Philosophical Transactions," Vol. LI., p. 514.

electric matter from the clouds, and thereby securing buildings, &c., which, you say, he seems to doubt, I must own I think he only speaks modestly and judiciously. I find I have been but partly understood in that matter. I have mentioned it in several of my letters, and, except once, always in the *alternative*, viz., that pointed rods erected on buildings, and communicating with the moist earth, would either *prevent* a stroke, *or*, if not prevented, would *conduct* it, so as that the building should suffer no damage. Yet, whenever my opinion is examined in Europe, nothing is considered but the probability of those rods *preventing* a stroke or explosion, which is only a *part* of the use I proposed for them ; and the other part, their conducting a stroke, which they may happen not to prevent, seems to be totally forgotten, though of equal importance and advantage.

I thank you for communicating M. de Buffon's relation of the effect of lightning at Dijon, on the 7th of June last. In return, give me leave to relate an instance I lately saw of the same kind. Being in the town of Newbury in New England, in November last, I was shown the effect of lightning on their church, which had been struck a few months before. The steeple was a square tower of wood, reaching seventy feet up from the ground to the place where the bell hung, over which rose a taper spire, of wood likewise, reaching seventy feet higher, to the vane of the weather-cock. Near the bell was fixed an iron hammer to strike the hours ; and from the tail of the hammer a wire went down through a small gimlet-

hole in the floor that the bell stood upon, and through a second floor in like manner ; then horizontally under and near the plastered ceiling of that second floor, till it came near a plastered wall ; then down by the side of that wall to a clock, which stood about twenty feet below the bell. The wire was not bigger than a common knitting-needle. The spire was split all to pieces by the lightning, and the parts flung in all directions over the square in which the church stood, so that nothing remained above the bell.

The lightning passed between the hammer and the clock in the abovementioned wire, without hurting either of the floors, or having any effect upon them (except making the gimlet-holes, through which the wire passed, a little bigger), and without hurting the plastered wall, or any part of the building, so far as the aforesaid wire and the pendulum-wire of the clock extended ; which latter wire was about the thickness of a goose-quill. From the end of the pendulum, down quite to the ground, the building was exceedingly rent and damaged, and some stones in the foundation-wall torn out, and thrown to the distance of twenty or thirty feet. No part of the aforementioned long, small wire, between the clock and the hammer, could be found, except about two inches that hung to the tail of the hammer, and about as much that was fastened to the clock ; the rest being exploded, and its particles dissipated in smoke and air, as gun-powder is by common fire, and had only left a black smutty track on the plastering, three or four inches

broad, darkest in the middle, and fainter towards the edges, all along the ceiling, under which it passed, and down the wall. These were the effects and appearances ; on which I would only make the following remarks, viz.

1. That lightning, in its passage through a building, will leave wood to pass as far as it can in metal, and not enter the wood again till the conductor of metal ceases.

And the same I have observed in other instances, as to walls of brick or stone.

2. The quantity of lightning that passed through this steeple must have been very great, by its effects on the lofty spire above the bell, and on the square tower, all below the end of the clock-pendulum.

3. Great as this quantity was, it was conducted by a small wire and a clock-pendulum, without the least damage to the building so far as they extended.

4. The pendulum rod, being of a sufficient thickness, conducted the lightning without damage to itself ; but the small wire was utterly destroyed.

5. Though the small wire was itself destroyed, yet it had conducted the lightning with safety to the building.

6. And from the whole it seems ^{from all things considered} probable that if even such a small wire had been extended from the spindle of the vane to the earth, before the storm, no damage would have been done to the steeple by that stroke of lightning, though the wire itself had been destroyed.

B. FRANKLIN.

CXVIII.

TO PETER COLLINSON.

PHILADELPHIA, 25 August, 1755.

DEAR SIR :—As you have my former papers on whirlwinds, &c., I now send you an account of one which I had lately an opportunity of seeing and examining myself.

Being in Maryland, riding with Colonel Tasker, and some other gentlemen, to his country-seat, where I and my son were entertained by that amiable and worthy man with great hospitality and kindness, we saw, in the vale below us, a small whirlwind beginning in the road, and showing itself by the dust it raised and contained. It appeared in the form of a sugar-loaf, spinning on its point, moving up the hill towards us, and enlarging as it came forward. When it passed by us, its smaller part near the ground appeared no bigger than a common barrel ; but, widening upwards, it seemed, at forty or fifty feet high, to be twenty or thirty feet in diameter. The rest of the company stood looking after it ; but, my curiosity being stronger, I followed it, riding close by its side, and observed its licking up, in its progress, all the dust that was under its smaller part. As it is a common opinion that a shot, fired through a water-spout, will break it, I tried to break this little whirlwind, by striking my whip frequently through it, but without any effect. Soon after, it quitted the road and took into the woods, growing every moment larger and stronger, raising, instead of dust, the old dry leaves

with which the ground was thick covered, and making a great noise with them and the branches of the trees, bending some tall trees round in a circle swiftly and very surprisingly, though the progressive motion of the whirl was not so swift but that a man on foot might have kept pace with it ; but the circular motion was amazingly rapid. By the leaves it was now filled with, I could plainly perceive that the current of air they were driven by moved upwards in a spiral line ; and when I saw the passing whirl continue entire, after leaving the trunks and bodies of large trees which it had enveloped, I no longer wondered that my whip had no effect on it in its smaller state. I accompanied it about three quarters of a mile, till some limbs of dead trees, broken off by the whirl, flying about and falling near me, made me more apprehensive of danger ; and then I stopped, looking at the top of it as it went on, which was visible, by means of the leaves contained in it, for a very great height above the trees. Many of the leaves, as they got loose from the upper and widest part, were scattered in the wind ; but so great was their height in the air, that they appeared no bigger than flies. My son, who was by this time come up with me, followed the whirlwind till it left the woods, and crossed an old tobacco-field, where, finding neither dust nor leaves to take up, it gradually became invisible below, as it went away over the field. The course of the general wind then blowing was along with us as we travelled, and the progressive motion of the whirlwind was in a direction nearly opposite, though it did

not keep a straight line, nor was its progressive motion uniform, it making little sallies on either hand as it went, proceeding sometimes faster and sometimes slower, and seeming sometimes for a few seconds almost stationary, then starting forward pretty fast again. When we rejoined the company, they were admiring the vast height of the leaves now brought by the common wind over our heads. These leaves accompanied us as we travelled, some falling now and then round about us, and some not reaching the ground till we had gone near three miles from the place where we first saw the whirlwind begin. Upon my asking Colonel Tasker if such whirlwinds were common in Maryland, he answered pleasantly : "No, not at all common ; but we got this on purpose to treat Mr. Franklin." And a very high treat it was to,

Dear Sir,

Your affectionate friend and humble servant,

B. FRANKLIN.

CXIX.

TO JARED ELIOT.

PHILADELPHIA, 31 August, 1755.

DEAR FRIEND :—I have been employed almost all this summer in the service of an unfortunate army, and other public affairs, that have brought me greatly in arrear with my correspondents. I have lost the pleasure of conversing with them, and I have lost my labor. I wish these were the only losses of the year ;

but we have lost a number of brave men, and all our credit with the Indians. I fear these losses may soon be productive of more and greater.

I have had no opportunity of making the inquiry you desired relating to Leonard. Somerset County in Maryland is one hundred and fifty miles from hence, and out of the common road of travellers or the post; nor have I any correspondent or acquaintance there. But now, while I am writing, I recollect a friend I have at Newtown, within fifty miles of Somerset, who has a very general knowledge of those parts and of the people, as he practises the law in all the counties on the Eastern Shore of Maryland. I will immediately write to him about it.

I am sorry your newspapers miscarry. If your riders are not more careful I must order them to be changed. The Mitchell, who made the map, is our Dr. Mitchell. I send you one of Evans's new maps, which I imagine will be agreeable to you. Please to accept it. I am glad to hear your son has acquired the art of making steel. I hope it will prove profitable. Mr. Roberts is pleased that you so kindly accept his fork and rake. I suppose he will write to you; but he is a man of much business, and does not love writing. I shall learn once more (for he told me once and I have forgotten it) how those teeth are put in and send you word; but perhaps our friend Bartram can tell you. He delivers you this, and I need not recommend him to you, for you are already acquainted with his merit, though not with his face and person. You will have a great deal of pleasure

in one another's conversation. I wish I could be within hearing, but that cannot be. He is upon one of his rambles in search of knowledge, and intends to view both your sea-coast and back country.

Remember me kindly to Mr. Tufts and Mr. Rugles when you see them. My respects to your good lady and family. With the greatest esteem, I am, dear Sir, your most affectionate, &c.,

B. FRANKLIN.

CXX.

TO JARED ELIOT.

PHILADELPHIA, 1 September, 1755.

DEAR SIR :—I wrote to you yesterday, and now I write again. You will say, *It can't rain, but it pours* ; for I not only send you *manuscript* but *living* letters. The *former* may be short, but the *latter* will be longer and yet more agreeable. Mr. Bartram I believe you will find to be at least twenty folio pages, large paper well filled, on the subjects of botany, fossils, husbandry, and the first creation. This Mr. Alison is as many or more on agriculture, philosophy, your own catholic divinity, and various other points of learning equally useful and engaging. Read them both. It will take you at least a week ; and then answer by sending me two of the like kind, or by coming yourself. If you fail of this, I shall think I have overbalanced my epistolary account, and that you will be in my debt as a correspondent for at least twelve months to come.

I remember with pleasure the cheerful hours I enjoyed last winter in your company, and would with all my heart give any ten of the thick old folios that stand on the shelves before me for a *little book* of the stories you then told with so much propriety and humor. Adieu, my dear friend, and believe me ever yours affectionately,

B. FRANKLIN.

CXXI.

TO MISS CATHERINE RAY.

PHILADELPHIA, 11 September, 1755.

Begone, business, for an hour, at least, and let me chat a little with my Katy.

I have now before me, my dear girl, three of your favors, viz., of March the 3d, March the 30th, and May the 1st. The first I received just before I set out on a long journey, and the others while I was on that journey, which held me near six weeks. Since my return I have been in such a perpetual hurry of public affairs of various kinds, as renders it impracticable for me to keep up my private correspondences, even those that afforded me the greatest pleasure.

You ask in your last how I do, and what I am doing, and whether everybody loves me yet, and why I make them do so.

In regard to the first, I can say, thanks to God, that I do not remember I was ever better. I still relish all the pleasures of life that a temperate man can in reason desire, and through favor I have them

all in my power. This happy situation shall continue as long as God pleases, who knows what is best for his creatures, and I hope will enable me to bear with patience and dutiful submission any change he may think fit to make that is less agreeable. As to the second question, I must confess (but don't you be jealous) that many more people love me now than ever did before; for since I saw you I have been enabled to do some general services to the country and to the army, for which both have thanked and praised me, and say they love me. They say so, as you used to do; and if I were to ask any favors of them, they would, perhaps, as readily refuse me; so that I find little real advantage in being beloved, but it pleases my humor.

Now it is near four months since I have been favored with a single line from you; but I will not be angry with you, because it is my fault. I ran in debt to you three or four letters, and, as I did not pay, you would not trust me any more, and you had some reason. But, believe me, I am honest, and, though I should never make equal returns, you shall see I will keep fair accounts. Equal returns I can never make, though I should write to you by every post; for the pleasure I receive from one of yours is more than you can have from two of mine. The small news, the domestic occurrences among our friends, the natural pictures you draw of persons, the sensible observations and reflections you make, and the easy, chatty manner in which you express every thing, all contribute to heighten the pleasure; and the more as

they remind me of those hours and miles that we talked away so agreeably, even in a winter journey, a wrong road, and a soaking shower.

I long to hear whether you have continued ever since in that monastery¹; or have broke into the world again, doing petty mischief; how the lady Wards do, and how many of them are married, or about it; what is become of Mr. B—— and Mr. L——, and what the state of your heart is at this instant? But that, perhaps, I ought not to know; and, therefore, I will not conjure, as you sometimes say I do. If I could conjure, it should be to know what was that *oddest question about me that ever was thought of*, which you tell me a lady had just sent to ask you.

I commend your prudent resolutions, in the article of granting favors to lovers. But if I were courting you, I could not hardly approve such conduct. I should even be malicious enough to say you were too *knowing*, and tell you the old story of The Girl and the Miller. I enclose you the songs you write for, and with them your Spanish letter with a translation. I honor that honest Spaniard for loving you. It showed the goodness of his taste and judgment. But you must forget him, and bless some worthy young Englishman.

You have spun a long thread, five thousand and twenty-two yards. It will reach almost from Rhode Island hither. I wish I had hold of one end of it, to pull you to me. But you would break it rather than come. The cords of love and friendship are longer

¹ Block Island.

and stronger, and in times past have drawn me farther; even back from England to Philadelphia. I guess that some of the same kind will one day draw you out of that Island.

I was extremely pleased with the —— you sent me. The Irish people, who have seen it, say it is the right sort; but I cannot learn that we have any thing like it here. The cheeses, particularly one of them, were excellent. All our friends have tasted it, and all agree that it exceeds any English cheese they ever tasted. Mrs. Franklin was very proud, that a young lady should have so much regard for her old husband, as to send him such a present. We talk of you every time it comes to table. She is sure you are a sensible girl, and a notable housewife, and talks of bequeathing me to you as a legacy; but I ought to wish you a better, and hope she will live these hundred years; for we are grown old together, and if she has any faults, I am so used to them that I don't perceive them; as the song says,

“Some faults we have all, and so has my Joan,
But then they 're exceedingly small;
And, now I 'm grown used to them, so like my own,
I scarcely can see them at all;
My dear friends,
I scarcely can see them at all.”¹

¹ The author here quotes a stanza from one of his own “Songs,” written for the Junto. It has been printed in Professor McVickar’s “Life of Dr. Samuel Bard.”

MY PLAIN COUNTRY JOAN; A SONG.

“Of their Chloes and Phyllises poets may
prate,
I sing my plain country Joan,

These twelve years my wife, still the joy
of my life,
Blest day that I made her my own.

“Not a word of her face, of her shape, or her
air,
Or of flames, or of darts, you shall hear;
I beauty admire, but virtue I prize,
That fades not in seventy year.

“Am I loaded with care, she takes off a large
share,
That the burden ne’er makes me to reel;

Indeed, I begin to think she has none, as I think of you. And since she is willing I should love you, as much as you are willing to be loved by me, let us join in wishing the old lady a long life and a happy.

With her respectful compliments to you, to your good mother and sisters, present mine, though unknown; and believe me to be, dear girl, your affectionate friend and humble servant, B. FRANKLIN.

P. S.—Sally says: “Papa, my love to Miss Katy.” If it was not quite unreasonable, I should desire you to write to me every post, whether you hear from me or not. As to your spelling, don’t let those laughing girls put you out of conceit with it. It is the best in the world, for every letter of it stands for something.

CXXII.

TO WILLIAM SHIRLEY.

PHILADELPHIA, 23 October, 1755.

SIR:—I beg leave to return your Excellency my most sincere and hearty thanks for your letter of the 17th of September, with the orders for the payment of wagon owners, and an extract of your orders to Colonel Dunbar, forbidding the enlistment of servants and

Does good fortune arrive, the joy of my wife
Quite doubles the pleasure I feel.

“She defends my good name, even when I’m
to blame,
Firm friend as to man e’er was given;
Her compassionate breast feels for all the
distressed,
Which draws down more blessings from
heaven.

“In health a companion delightful and dear,
Still easy, engaging, and free;
In sickness no less than the carefulest
nurse,
As tender as tender can be.

“In peace and good order my household she
guides,

Right careful to save what I gain;
Yet cheerfully spends, and smiles on the
friends
I’ve the pleasure to entertain.

“Some faults have we all, and so has my
Joan,
But then they’re exceedingly small,
And, now I’m grown used to them, so like
my own
I scarcely can see them at all.

“Were the finest young princess, with millions
in purse,
To be had in exchange for my Joan,
I could not get better wife, might get a
worse,
So I’ll stick to my dearest old Joan.”

apprentices.¹ Acts of justice so readily done become great favors, which I hope will be ever gratefully acknowledged by this people in actions as well as words.

I have also your favor of the 5th instant. Governor Morris is gone to Newcastle, to meet the Assembly of the Lower Counties, so that I cannot at present see the papers you refer me to, but I shall wait upon him in my journey to Virginia; and if, on perusing those papers, any thing seeming worthy of your notice should occur to me, I shall communicate my sentiments to you with that honest freedom which you always approve.

This journey, which I cannot now avoid, will deprive me of the pleasure of waiting on your Excellency in New York at the time you mention. I hear, too, that the governor does not purpose to send any commissioners thither, but to go himself. I know not what is to be the particular subject of your consultations; but as I believe all your schemes have

¹At this time General Shirley was Governor of Massachusetts. He was with the army at Oswego, as commander-in-chief of his Majesty's forces in America. It appears, that he never entirely fulfilled the good intentions expressed in his letter. In his autobiography, Dr. Franklin gives a particular account of the services he rendered to General Braddock, in procuring horses and wagons for his expedition. He expended, of his own money, upwards of a thousands pounds sterling. This sum was in part returned by General Braddock, but the remainder was never paid. When Lord Loudoun succeeded General Shirley, the accounts were examined and compared with the vouchers by the proper officer, and certified to be right; but Lord Loudoun declined giving an order on the paymaster for the

balance, stating as a reason, that he preferred not to mix up his accounts with those of his predecessors; and, as Franklin was then on the point of departing for England, he referred him to the treasury in London, where, he said, payment would immediately be made. The application to the treasury, however, was unsuccessful. The closing paragraph of the Governor's letter ran as follows:

"Though I am at present engaged in a great hurry of business, being to move from hence in a very few days for Niagara, I cannot conclude without assuring you that I have the highest sense of your public services in general, and particularly that of engaging those wagons, without which General Braddock could not have proceeded. I am, with great esteem, &c.

"W. SHIRLEY."

the King's service (which is the public good) in view, I cannot but wish them success.

Our Assembly meets the beginning of December, when I hope to be at home again ; and if any assistance is to be required of them and the people here, depend on my faithful services, so far as my little sphere of influence shall extend. With the highest esteem and respect, I have the honor to be, &c.,

B. FRANKLIN.

CXXIII.

TO JAMES READ.

PHILADELPHIA, 2 November, 1755.

DEAR SIR :—I have your letter by Mr. Sea, and one just now by express. I am glad to hear the arms are well got up ; they are the best that we could procure. I wish they were better ; but they are well fortified, will bear a good charge, and I should imagine they would do good service with swan or buck shot, if not so fit for single ball. I have been ill these eight days, confined to my room and bed most of the time, but am now getting better. I have, however, done what I could in sending about to purchase arms, &c., for the supply of the frontiers, and can now spare you fifty more, which I shall send up to-morrow with some flints, lead, swan-shot, and a barrel of gunpowder. The arms will be under your care and Mr. Weiser's,¹ you being gentlemen in commission from the governor. Keep an account of

¹ Conrad Weiser, celebrated as an Indian interpreter for many years, highly respected for his character, and of great influence with the Indians.

whose hands you put them into. Let them be prudent, sober, careful men, such as will not rashly hurt our friends with them, and such as will honestly return them when peace shall be happily restored.

I sincerely commiserate the distress of your out settlers. The Assembly sit to-morrow, and there is no room to doubt of their hearty endeavours to do every thing necessary for the country's safety. I wish the same disposition may be found in the governor, and I hope it. I have put off my journey to Virginia, and you may depend on my best services for the common welfare, so far as my little influence extends. I am your affectionate kinsman and humble servant,

B. FRANKLIN.

P. S.—My best respects to Mr. Weiser. Nine hundred arms with ammunition have been sent up by the Committee of Assembly to different parts of the frontier.

CXXIV.

AN ACT¹

FOR THE BETTER ORDERING AND REGULATING SUCH AS ARE WILLING AND DESIROUS TO BE UNITED FOR MILITARY PURPOSES IN PENNSYLVANIA.

Whereas this province was first settled by (and a majority of the Assemblies have ever since been of)

¹ The defeat of General Braddock at the battle of the Monongahela, on the 9th of July, 1755, had filled the people of Pennsylvania with alarm. The Assembly at its next session made a large grant in money for purposes of defence. The doctrine of non-resistance, which was a part of the creed of a large portion of the population, had

hitherto prevented the establishment of any efficient militia system. To meet the crisis, Franklin drew up the following act for embodying and disciplining a voluntary militia. It was carried through the House, he says, without much difficulty, because care had been taken to leave the Quakers at liberty.

the people called Quakers, who, though they do not, as the world is now circumstanced, condemn the use of arms in others, yet are principled against bearing arms themselves ; and to make any law to compel them thereto against their consciences, would be not only to violate a fundamental in our constitution, and be a direct breach of our charter of privileges, but would also in effect be to commence persecution against all that part of the inhabitants of the province ; and for them by any law to compel others to bear arms, and exempt themselves, would be inconsistent and partial ; yet forasmuch as, by the general toleration and equity of our laws, great numbers of people of other religious denominations are come among us, who are under no such restraint, some of whom have been disciplined in the art of war, and conscientiously think it their duty to fight in defence of their country, their wives, their families, and estates, and such have an equal right to liberty of conscience with others ; and whereas a great number of petitions from the several counties of this province have been presented to this House, setting forth that the petitioners are very willing to defend themselves and their country, and desirous of being formed into regular bodies for that purpose, instructed and disciplined under proper officers with suitable and legal authority ; representing withal, that unless measures of this kind are taken, so as to unite them together, subject them to due command, and thereby give them confidence in each other, they cannot assemble to oppose the enemy without the utmost danger of exposing themselves to confusion and destruction ;

And whereas the voluntary assembling of great bodies of armed men from different parts of the province on any occasional alarm, whether true or false, as of late hath happened, without call or authority from the government, and without due order and direction among themselves, may be attended with danger to our neighbouring Indian friends and allies, as well as to the internal peace of the province ;

And whereas the governor hath frequently recommended it to the Assembly, that, in preparing and passing a law for such purposes, they should have a due regard for scrupulous and tender consciences, which cannot be done where compulsive means are used to force men into military service ; therefore, as we represent all the people of the province, and are composed of members of different religious persuasions, we do not think it reasonable that any should, through a want of legal powers, be in the least restrained from doing what they judge it their duty to do for their own security and the public good ; we, in compliance with the said petitions and recommendations, do offer it to the governor to be enacted, and be it enacted by the Honorable Robert Hunter Morris, with the King's royal approbation lieutenant-governor, under Thomas Penn and Richard Penn, true and absolute proprietors of the province of Pennsylvania, and of the counties of Newcastle, Kent, and Sussex, upon Delaware, by and with the advice and consent of the representatives of the freemen of the said province in General Assembly met, and by the authority of the same, that, from and after the pub-

lication of this act, it shall and may be lawful for the freemen of this province to form themselves into companies, as heretofore they have used in time of war without law, and for each company, by majority of votes in the way of ballot, to choose its own officers, to wit, a captain, lieutenant, and ensign, and present them to the governor or commander-in-chief for the time being for his approbation; which officers so chosen, if approved and commissioned by him, shall be the captain, lieutenant, and ensign of each company respectively, according to their commissions; and the said companies being divided into regiments by the governor or commander-in-chief, it shall and may be lawful for the officers so chosen and commissioned for the several companies of each regiment to meet together, and by majority of votes, in the way of ballot, to choose a colonel, lieutenant-colonel, and major for the regiment, and present them to the governor or commander-in-chief for his approbation; which officers so chosen, if approved and commissioned by him, shall be the colonel, lieutenant-colonel, and major of the regiment, according to their commissions, during the continuance of this act.

Provided always, that if the governor or commander-in-chief shall not think fit to grant his commission to any officer so first chosen and presented, it shall and may be lawful for the electors of such officer to choose two other persons in his stead, and present them to the governor or commander-in-chief, one of whom, at his pleasure, shall receive his commission, and be the officer as aforesaid.

And be it further enacted by the authority aforesaid, that as soon as the said companies and regiments are formed, and their officers commissioned as aforesaid, it shall and may be lawful to and for the governor or commander-in-chief, by and with the advice and consent of the colonels, lieutenant-colonels, and majors of all the regiments, being for that purpose by him called and convened, or by and with the advice and consent of a majority of the said officers that shall be met and present together on such call, to form, make, and establish articles of war, for the better government of the forces that shall be under their command, and for bringing offenders against the same to justice, and to erect and constitute courts-martial, with power to hear, try, and determine any crimes or offences by such articles of war, and inflict penalties by sentence or judgment of the same on those who shall be subject thereto in any place within this province. Which articles of war, when made as aforesaid, shall be printed and distributed to the captains of the several companies, and by them distinctly read to their respective companies; and all and every captain, lieutenant, ensign, or other freeman who shall, after at least three days' consideration of the said articles, voluntarily sign the same, in presence of some one justice of the peace, acknowledging his having perused or heard the same distinctly read, and that he has well considered thereof, and is willing to be bound and governed thereby, and promises obedience thereto, and to his officers accordingly, shall henceforth be deemed

well and duly bound to the observance of the said articles, and to the duties thereby required, and subject to the pains, penalties, punishments, and forfeitures that may therein be appointed for disobedience and other offences.

Provided always that the articles, so to be made and established, shall contain nothing repugnant, but be as near as possible conformable, to the military laws of Great Britain, and to the articles of war made and established by his Majesty in pursuance of the last act of Parliament for punishing mutiny and desertion, the different circumstances of this province compared with Great Britain, and of a voluntary militia of freemen compared with mercenary standing troops, being duly weighed and maturely considered.

Provided, also, that nothing in this act shall be understood or construed to give any power or authority to the governor or commander-in-chief, and the said officers, to make any articles or rules that shall in the least affect those of the inhabitants of the province who are conscientiously scrupulous of bearing arms, either in their liberties, persons, or estates; nor any other persons of what persuasion or denomination soever, who have not first voluntarily and freely signed the said articles after due consideration as aforesaid.

Provided, also, that no youth under the age of twenty-one years, nor any bought servant or indentured apprentice, shall be admitted to enroll himself, or be capable of being enrolled, in the said companies or regiments, without the consent of his or

their parents or guardians, masters or mistresses, in writing, under their hands first had and obtained.

Provided, also, that no enlistment or enrolment of any person in any of the companies or regiments to be formed and raised as aforesaid, shall protect such person in any suit or civil action brought against him by his creditors or others, except during his being in actual service in field or garrison ; nor from a prosecution for any offence committed against the laws of this province.

Provided, also, that no regiment, company, or party of volunteers shall, by virtue of this act, be compelled or led more than three days' march beyond the inhabited parts of the province ; nor detained longer than three weeks in any garrison, without an express engagement for that purpose, first voluntarily entered into and subscribed by every man so to march or remain in garrison.

This act to continue in force until the 30th day of October next, and no longer.

CXXV.

TO WILLIAM PARSONS.¹

PHILADELPHIA, 5 December, 1755.

DEAR SIR :—I received your favor of November 25th, and take this first opportunity of acquainting you, that an act is passed granting £60,000 chiefly

¹ William Parsons was one of the earliest members of the *Funto*, formed by Franklin soon after he established himself in Philadelphia. He was

afterwards Surveyor-General of Pennsylvania. When this letter was written he was at Easton. He died in 1758.

for the defence of the province, and is to be disposed of for that purpose, by seven persons, namely, Isaac Norris, James Hamilton, J. Mifflin, Joseph Fox, Evan Morgan, John Hughes, and your old friend. We meet every day, Sundays not excepted, and have a good agreement with the governor. Three hundred men are ordered to be immediately raised on pay, to range the frontiers, and blockhouses for stages to be erected at proper distances and garrisoned ; so that I hope in a little time to see things in a better posture. A militia act is also passed, of which, if people are well disposed, a good use may be made, and bodies of men be ready on any occasion to assist and support the rangers. All parties laid aside, let you and I use our influence to carry this act into execution.

I received also your letter of the 27th, relating the unhappy affair of Gnadenhutten, and desiring arms. I have accordingly procured and sent up by a wagon to one George Overpack's, a chest of arms containing fifty, and five loose, fifty-five in all, of which twenty-five are for Easton, and thirty to be disposed of to such persons nearest danger on the frontiers, who are without arms and unable to buy, as yourself with Messrs. Atkins and Martin may judge most proper ; letting all know that the arms are only lent for their defence, that they belong to the public, and must be held forthcoming when the government shall demand them, for which each man should give his note. By the same wagon we send twenty-five guns for Lehigh township, and ten for Bethlehem to the Moravian

Brethren, which make in all one hundred ; with which goes one hundred weight of gunpowder, and four hundred pounds of lead ; so there should be one pound of powder and four pounds of lead divided to each man.

Who brought your last letter to me I know not, it being left at my house. You mention sending a wagon, and I daily expected to see the wagoner, but he never called on me for an answer. Please let me know by a line when you have received what is sent. I am your affectionate friend and humble servant,

B. FRANKLIN.

CXXVI.

TO WILLIAM PARSONS.

PHILADELPHIA, 15 December, 1755.

DEAR FRIEND :—We received yours of the 13th. You will before this time have received the arms and ammunition, blankets, &c., sent up for an intended ranging party. They may be made use of for the defence of your town till we arrive. Captain Trump, from Upper Dublin, marches the day after to-morrow with fifty men to your assistance. The provisions for their use go with them, so that they will not burden you. Orders are gone to Captains Aston and Wayne to march also with their companies immediately. They will remain on your frontier two or three months, till they can be relieved by others.

Mr. Hamilton and myself will set out on Thursday to visit you, and erect blockhouses in proper places. Think of suitable officers for raising and commanding men to be kept in the province pay; for Mr. Hamilton does not know the people your way, nor do I know whom to recommend. He will bring some blank commissions with him. I enclose you twenty pounds towards buying meal and meat for the poor fugitives that take refuge with you. Be of good courage, and God guide you. Your friends will never desert you. I am yours affectionately,

B. FRANKLIN.¹

¹ Franklin was extremely active in providing for the defence of the frontiers, as well by his personal efforts, as in the capacity of one of the commissioners for that purpose. The following memoranda were found by Mr. Duane among Franklin's papers.

"Considerations to be taken.

"What number of men?

"Should the post be fortified, and in what manner?

"How long to be continued there?

"Could they not be partly employed in raising their own provisions?

"Could they have some lots of land assigned them for their encouragement?

"What their pay; and from what funds?

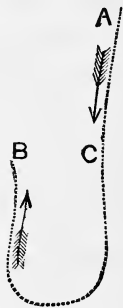
"How much the annual expense?

"Is it certain that the late method of giving rewards for apprehending rioters will be effectual?

"To whom does the land belong?"

In one of his letters he said: "The fifty arms now sent are all furnished with staples for sling straps, that, if the governor should order a troop or company of rangers on horseback, the pieces may be slung at the horsemen's backs. A party on the scout should observe several rules to avoid being

tracked and surprised in their encampments at night. This may be done sometimes when they come to a creek or run, by entering the run and travelling up the stream or down the stream, in the water, a mile or two, and then encamp, the stream effacing the track, and the enemy at a loss to know whether the party went up or down. Suppose a party marching from *A* intends to halt at *B*, they do not go straight to *B* and stop there, but pass by at some little distance, and make a turn which brings them thither. Between *B* and *C* two or three sentinels are placed to watch the track, and give immediate notice at *B*, if they perceive any party pass by in pursuit, with an account of the number, &c., which enables the party at *B* to prepare and attack them if they judge that proper, or gives them time to escape. But I add no more of this kind, recollecting that Mr. Weiser must be much better acquainted with all these things than I am."



CXXVII.

A DIALOGUE¹

BETWEEN X, Y, & Z, CONCERNING THE PRESENT STATE OF AFFAIRS IN
PENNSYLVANIA.

X. Your servant, Gentlemen ; I am glad to see you at my house. Is there any thing new to-day ?

Y. We have been talking of the militia act ; have you seen it ?

X. Yes ; I have read it in the papers.

Z. And what do you think of it ?

X. The more I consider it, the better I like it. It appears to me a very good act, and I am persuaded will be of good use, if heartily carried into execution.

Z. Ay, that may be ; but who is to carry it into execution ? It says that people may form themselves into companies, and choose their own officers ; but there is neither time nor place appointed for this transaction, nor any person directed or empowered to call them together.

X. It is true ; but methinks there are some words that point out the method pretty plain to willing minds. And it seems to me, that we who joined so sincerely in the petitions for a militia law, and really thought one absolutely necessary for the safety of our country, should, now we have obtained the law, rather endeavour to *explain* than *invent* difficulties in the construction of it.

Y. What are those words you mention ?

X. Here is the act itself ; I will read that part of

¹ This *Dialogue*, was first printed in the *Pennsylvania Gazette*, December 18. 1755.

it: "From and after the publication of this act, it shall and may be lawful for the freemen of this province to form themselves into companies, *as heretofore they used in time of war without law*, and for each company, by majority of votes, in the way of ballot, to choose its own officers, &c." The words I meant are these: "*as heretofore they used in time of war.*" Now I suppose we have none of us forgot the association in the time of the last war; it is not so long since, but that we may well enough remember the method we took to form ourselves into companies, choose our officers, and present them to the governor for approbation and commissions; and the act in question says plainly we may now *lawfully do*, in this affair, what we then did *without law*.

Y. I did not before take so much notice of those words, but, to be sure, the thing is easy enough; for I remember very well how we managed at that time. And indeed it is easier to effect it now than it was then; for the companies and regiments, and their districts, &c., were then all to form and settle. But now why may not the officers of the old companies call the old associators together, with such others in the district of each company as incline to be concerned, and proceed immediately to a new choice by virtue of the act? Other new companies may in other places be formed, as the associated companies were.

Z. You say right. And if this were all the objection to the act, no doubt they would do so immediately. But it is said there are other faults in it.

X. What are they?

Z. The act is so loose that persons who never intended to engage in the militia, even *Quakers*, may meet and vote in the choice of the officers.

X. Possibly ;—but was any such thing observed in the association elections?

Z. Not that I remember.

X. Why should it be more apprehended now than it was at that time? Can they have any motives to such a conduct now, which they had not then?

Z. I cannot say.

X. Nor can I. If a militia be necessary for the safety of the province, I hope we shall not boggle at this little difficulty. What else is objected?

Z. I have heard this objected : That it were better the governor should appoint the officers ; for, the choice being in the people, a man very unworthy to be an officer may happen to be popular enough to get himself chosen by the undiscerning mob.

X. It is possible. And if all officers appointed by governors were always men of merit, and fully qualified for their posts, it would be wrong ever to hazard a popular election. It is reasonable, I allow, that the commander-in-chief should not have officers absolutely forced upon him, in whom, from his knowledge of their incapacity, he can place no confidence. And, on the other hand, it seems likely that the people will engage more readily in the service, and face danger with more intrepidity when they are commanded by a man they know and esteem, and on whose prudence and courage, as well as good-will and integrity, they can have reliance, than they would

under a man they either did not know or did not like. For, supposing governors ever so judicious and upright in the distribution of commissions, they cannot know everybody in every part of the province, and are liable to be imposed on by partial recommendations; but the people generally know their neighbours. And, to me, the act in question seems to have hit a proper medium between the two modes of appointing. The people choose, and if the governor approves, he grants the commission; if not, they are to choose a second, and even a third time. Out of three choices it is probable one may be right; and where an officer is approved both by superiors and inferiors, there is the greatest prospect of those advantages that attend a good agreement in the service. This mode of choice is moreover agreeable to the liberty and genius of our constitution. It is similar to the manner in which by our laws sheriffs and coroners are chosen and approved. And yet it has more regard to the prerogative than the mode of choice in some colonies, where the military officers are either chosen absolutely by the companies themselves, or by the House of Representatives, without any negative on that choice, or any approbation necessary from the governor.

Y. But is that agreeable to the English constitution?

X. Considered in this light, I think it is; British subjects, by removing into America, cultivating a wilderness, extending the dominion, and increasing the wealth, commerce, and power of their mother country at the hazard of their lives and fortunes,

ought not, and in fact do not, thereby lose their native rights. There is a power in the crown to grant a continuance of those rights to such subjects in any part of the world, and to their posterity born in such new country ; and for the farther encouragement and reward of such merit, to grant additional liberties and privileges, not used in England, but suited to the different circumstances of different colonies. If then the grants of those additional liberties and privileges may be regularly made under an English constitution, they may be enjoyed agreeably to that constitution.

Y. But the act is very short ; there are numberless circumstances and occasions pertaining to a body of armed men which are not, as they ought to have been, expressly provided for in the act.

X. It is true there are not express provisions in the act for all circumstances, but there is a power lodged by the act in the governor and field-officers of the regiments to make all such provisions in the articles of war which they may form and establish.

Y. But can it be right in the legislature, by any act, to delegate their power of making laws to others ?

X. I believe not, generally ; but certainly in particular cases it may. Legislatures may, and frequently do, give to corporations power to make by-laws for their own government. And in this case the act of Parliament gives the power of making articles of war for the government of the army to the King alone, and there is no doubt but the Parliament understands the rights of government.

Y. Are you sure the act of Parliament gives such power?

X. This is the act. The power I mention is here in the 55th section: "Provided always, that it shall and may be lawful to and for his Majesty to form, make, and establish articles of war for the better government of his Majesty's forces, and for bringing offenders against the same to justice; and to erect and constitute courts-martial, with power to try, hear, and determine any crimes or offences by such articles of war, and inflict penalties by sentence or judgment of the same." And here you see, bound up with the act, the articles of war, made by his Majesty in pursuance of the act, and providing for every circumstance.

Z. It is, sure enough. I had been told that our act of Assembly was impertinently singular in this particular.

X. The governor himself, in a message to the House, expressly recommended this act of Parliament for their imitation, in forming the militia bill.

Z. I never heard that before.

X. But it is true. The Assembly, however, considering that this militia would consist chiefly of freeholders, have varied a little from that part of the act of Parliament, in favor of liberty; they have not given the sole power of making those articles of war *to the governor*, as that act does to the King; but have joined with the governor, for that purpose, a number of officers to be chosen by the people. The articles, moreover, are not to be general laws, binding on all

the province, nor on any man who has not first approved of them and voluntarily engaged to observe them.

Z. Is there no danger that the governor and officers may make those articles too severe?

X. Not without you can suppose them enemies to the service and to their country; for, if they should make such as are unfit for freemen and Englishmen to be subjected to, they will get no soldiers; nobody will engage. In some cases, however, if you and I were in actual service, I believe we should both think it necessary for our own safety, that the articles should be pretty severe.

Z. What cases are they?

X. Suppose a sentinel should betray his trust, give intelligence to the enemy, or conduct them into our quarters.

Z. To be sure there should be severe punishments for such crimes, or we might all be ruined.

X. Choose reasonable men for your officers, and you need not fear their making reasonable laws; and if they make such, I hope reasonable men will not refuse to engage under them.

Y. But here is a thing I do not like. By this act of Assembly the Quakers are neither compelled to muster nor to pay a fine if they do not.

X. It is true; nor could they be compelled either to muster or pay a fine of that kind by any militia law made here. They are exempted by the charter and fundamental laws of the province.

Y. How so?

X. See here ; it is the first clause in the charter. I will read it : “ Because no people can be truly happy, though under the greatest enjoyment of civil liberties, if abridged of the freedom of their consciences as to their *religious profession* and worship ; and Almighty God being the only lord of conscience, father of lights and spirits, and the author as well as object of all divine knowledge, faith, and worship, who only doth enlighten the minds, and persuade and convince the understandings of people, I do hereby grant and declare, That no person or persons inhabiting in this province or territories, who shall confess and acknowledge one Almighty God, the creator, upholder, and ruler of the world, and profess him or themselves obliged to live quietly under the civil government, shall be, IN ANY CASE, MOLESTED OR PREJUDICED in his or their PERSON OR ESTATE because of his or their *conscientious persuasion* or practice, nor be compelled to frequent or maintain any religious worship, place, or ministry, contrary to his or their mind, or to DO OR SUFFER ANY OTHER ACT OR THING, contrary to their religious persuasion.” And, in the 8th section of the same charter, you see a declaration, that “ neither the proprietor, nor his heirs or assigns, shall procure or do any thing or things whereby the liberties in this charter contained or expressed, nor any part thereof, shall be infringed or broken ; and if any thing shall be procured or done by *any person or persons* contrary to these presents, it shall be held of NO FORCE OR EFFECT.” This liberty of conscience, granted by charter, is also established by the first law in our

book, and confirmed by the crown. And, moreover, the governor has an express instruction from the proprietaries, that, in case of making any militia law, he shall take especial care that the charter be not infringed in this respect. Besides, most of our petitions for a militia from the moderate part of the people requested particularly that due regard might be had to scrupulous and tender consciences. When taxes are raised, however, for the King's service, the Quakers and Menonists pay their part of them, and a great part ; for, as their frugality and industry make them generally wealthy, their proportion is the greater compared with their numbers. And out of these taxes those men are paid who go into actual service. As for mustering and training, no militia are anywhere paid for that. It is by many justly delighted in, as a manly exercise. But those who are engaged in actual service for any time ought undoubtedly to have pay.

Y. There is no provision in this militia act to pay them.

X. There is a provision that no regiment, company, or party, though engaged in the militia, shall be obliged "to more than three days' march, &c., without an express engagement for that purpose, first voluntarily entered into and subscribed by every man, so to march or remain in garrison." And it is to be supposed that no man will subscribe such particular engagement without reasonable pay or other encouragement.

Y. But where is that pay to come from ?

X. From the government to be sure ; and out of the money struck by the act for granting £60,000.

Z. Yes ; but those who serve must pay a share of the tax, as well as those who do not.

X. Perhaps not. It is to be supposed that those who engage in the service for any time, upon pay, will be chiefly single men, and they are expressly exempted from the tax by the £60,000 act. Consequently those who do not serve must pay the more ; for the sum granted must be made up.

Z. I never heard before that they were exempted by that act.

X. It is so, I assure you.

Y. But there is no provision in the militia act for the maimed.

X. If they are poor, they are provided for by the laws of their country. There is no other provision by any militia law that I know of. If they have behaved well, and suffered in their country's cause, they deserve, moreover, some grateful notice of their service and some assistance from the common treasury ; and if any particular township should happen to be overburthened, they may, on application to the government, reasonably expect relief.

Z. Though the Quakers and others conscientiously scrupulous of bearing arms are exempted, as you say, by charter, they might, being a majority in the Assembly, have made the law compulsory on others. At present it is so loose that nobody is obliged by it who does not voluntarily engage.

X. They might, indeed, have made the law com-

pulsory on all others. But it seems they thought it more equitable and generous to leave to all as much liberty as they enjoy themselves, and not lay even a seeming hardship on others which they themselves declined to bear. They have, however, granted all we asked of them. Our petitions set forth that "we were freely willing and ready to defend ourselves and country, and all we wanted was legal authority, order, and discipline." These are now afforded by the law, if we think fit to make use of them. And, indeed, I do not see the advantage of compelling people of any sect into martial service merely for the sake of raising numbers. I have been myself in some service of danger, and I always thought cowards rather weakened than strengthened the party. Fear is contagious, and a panic once begun spreads like wildfire, and infects the stoutest heart. All men are not by nature brave; and a few who are so will do more effectual service by themselves than when accompanied by and mixed with a multitude of poltroons, who only create confusion and give advantage to the enemy.

Z. What signifies what you thought or think? Others think differently; and all the wise legislatures in the other colonies have thought fit to compel all sorts of persons to bear arms or suffer heavy penalties.

X. As you say, what I thought or think is not of much consequence. But a wiser legislator than all those you mention put together, and who better knew the nature of mankind, made his military law very different from theirs in that respect.

Z. What legislator do you mean?

X. I mean God himself, who would have no man led to battle that might rather wish to be at home, either from fear or other causes.

Z. Where do you find that law?

X. It is in the 20th chapter of *Deuteronomy*, where are these words: *When thou goest out to battle against thine enemies, the officers shall speak unto the people, saying, What man is there that hath built a new house, and hath not dedicated it? Let him go and return to his house, lest he die in the battle, and another man dedicate it. And what man is he that hath planted a vineyard, and hath not yet eaten of it? Let him also go and return unto his house, lest he die in the battle, and another man eat of it. And what man is there that hath betrothed a wife, and hath not taken her? Let him go and return unto his house, lest he die in the battle, and another man take her. And—*

Z. These all together could not be many; and this has no relation to cowardice.

X. If you had not interrupted me, I was coming to that part (verse 8): *And the officers shall speak further unto the people, and they shall say, What man is there that is FEARFUL and FAINT-HEARTED? Let him go and return unto his house, lest his brethren's heart faint, as well as his heart; that is, lest he communicate his fears, and his brave brethren catch the contagion, to the ruin of the whole army. Accordingly, we find that, under this military law, no people in the world fought more gallantly, or performed greater actions, than the Hebrew soldiery. And if you would*

be informed what proportion of people would be discharged by such a proclamation, you will find that matter determined by an actual experiment, made by General Gideon, as related in the 7th Chapter of Judges; for he, having assembled thirty-two thousand men against the Midianites, proclaimed, according to law (verse 3): *Whosoever is FEARFUL and AFRAID, let him return and depart early from Mount Gilead.*

Z. And pray, how many departed?

X. The text says there departed twenty-two thousand, and there remained but ten thousand men. A very great sifting! and yet on that particular occasion a farther sifting was required. Now it seems to me that this militia law of ours, which gives the brave all the advantages that they can desire, of order, authority, discipline, and the like, and compels no cowards into their company, is such a kind of sieve as the Mosaic proclamation. For, with us, not only every man who has built a house, or planted a vineyard, or betrothed a wife, or is afraid of his flesh, but the narrow bigot, filled with sectarian malice, if such there be, who hates Quakers more than he loves his country, his friends, his wife, or family, may say: *I will not engage, for I do not like the act; or, I do not like the officers that are chosen; or, I do not like the articles of war;* and so we shall not be troubled with them, but all that engage will be hearty.

Z. For my part, I am no coward, but hang me if I will fight to save the Quakers.

X. That is to say, you will not pump ship, because it will save the rats as well as yourself.

Y. You have answered most of the objections I have heard against the act to my satisfaction ; but there is one remaining. The method of carrying it into execution seems so roundabout, I am afraid we cannot have the benefit of it in any reasonable time.

X. I cannot see much in that objection. The several neighbourhoods out of which companies are formed, may meet and choose their company officers in one and the same day ; and the regiments may be formed, and field-officers chosen, in a week or ten days after, who may immediately proceed to consider the several militia laws of Britain and the colonies, and, with the governor, form out of them such articles as will appear most suitable for the freemen of this province, who incline to bear arms voluntarily ; and the whole may be in order in a month from the first elections, if common diligence be used. And, indeed, as the colonies are at present the prize contended for between Britain and France, and the latter, by the last advices, seems to be meditating some grand blow, part of which may probably fall on Pennsylvania, either by land or sea, or both, it behoves us I think, to make the best use we can of this act, and carry it immediately into execution, both in town and country. If there are any material defects in it, experience will best discover them, and show what is proper or necessary to amend them. The approaching winter will afford us some time to arm and prepare, and more leisure, than other seasons, for exercising and improving in good discipline.

Z. But if this act should be carried into execution,

prove a good one, and answer the end, what shall we have to say against the Quakers at the next election?

X. O my friends, let us on this occasion cast from us all these little party views, and consider ourselves as Englishmen and Pennsylvanians. Let us think only of the service of our King, the honor and safety of our country, and vengeance on its murdering enemies. If good be done, what imports it by whom it is done? The glory of serving and saving others is superior to the advantage of being served or secured. Let us resolutely and generously unite in our country's cause, in which to die is the sweetest of all deaths, and may the God of armies bless our honest endeavours.

CXXVIII.

TO MRS. DEBORAH FRANKLIN.

EASTON, Saturday Night, 27 December, 1755.

MY DEAR CHILD :—I received with pleasure yours of the 24th, which acquainted me of your and the family's welfare. I am glad to hear that the companies are forming in town and choosing their officers, and I hope the example will be followed throughout the country. We all continue well, but much harassed with business. After many difficulties and disappointments we marched two companies yesterday over the mountains, namely, Aston's and Trump's. We wait here only for shoes, arms, and blankets, expected hourly, and then shall move toward Berks County. Our compliments to Mrs. Masters and all inquiring friends. When you write next, direct to Mr. Read's

care at Reading. My duty to mother, and love to the children. I hope to find you all well at my return. My love to Mr. Hall. We have no fresh news here of mischief, to be depended on. Send the newspapers and my letters to Reading, and let me have all the little news about the X Y Z proceedings, officers, &c. I am obliged to Goody Smith for kindly remembering me. I am, with great affection, your loving husband,

B. FRANKLIN.

CXXIX.

COMMISSION FROM LIEUT.-GOVERNOR MORRIS.

The Honorable Robert Hunter Morris, Esquire, Lieutenant-Governor, and Commander-in-Chief of the Province of Pennsylvania, and Counties of Newcastle, Kent, and Sussex, on Delaware, to Benjamin Franklin.

I do hereby authorize and empower you to take into your charge the County of Northampton, to dismiss all persons who have been commissioned by me to any military command, and to put others into their places; and to fill up the blank commissions herewith delivered, with the names of such persons as you shall judge fit for his Majesty's service; hereby ratifying all your acts and proceedings, done in virtue of this power; and approving the expenses accruing thereupon. And I do further order and enjoin all officers and soldiers to yield obedience to you in the execution of this power, and all magistrates, sheriffs, and others, in any kind of civil authority, and all his Majesty's liege subjects, to be aiding and assisting you in the premises. Given under my hand and seal, at Reading, this 5th day of January, 1756.¹

ROBERT H. MORRIS.

¹ This was a special and temporary commission; after Franklin's return, in February, he was chosen and com-

missioned colonel of the Philadelphia regiment.

CXXX.

TO MRS. DEBORAH FRANKLIN.

BETHLEHEM, 15 January, 1756.

MY DEAR CHILD :—We move this day for Gnadenhutten. If you have not cash sufficient, call upon Mr. Moore, the treasurer, with that order of the Assembly, and desire him to pay you one hundred pounds of it. If he has not cash on hand, Mr. Norris (to whom my respects) will advance it for him. We shall have with us about one hundred and thirty men, and shall endeavour to act cautiously, so as to give the enemy no advantage through our negligence. Make yourself therefore easy. Give my hearty love to all friends. I hope in a fortnight or three weeks, God willing, to see the intended line of forts finished, and then I shall make a trip to Philadelphia, and send away the lottery tickets, and pay off the prizes, though you may pay such as come to hand of those sold in Philadelphia of my signing. They were but few, the most being sold abroad; and those that sold them and received the money will pay off the prizes. I hope you have paid Mrs. Stephens for the bills. I am, my dear child, your loving husband,

B. FRANKLIN.

CXXXI.

TO MRS. DEBORAH FRANKLIN.

GNADENHUTTEN, 25 January, 1756.

MY DEAR CHILD :—This day week we arrived here. I wrote to you the same day, and once since. We all continue well, thanks be to God. We have

been hindered with bad weather, yet our fort is in a good defensible condition, and we have every day more convenient living. Two more are to be built, one on each side of this, at about fifteen miles' distance. I hope both will be done in a week or ten days, and then I purpose to bend my course homewards.

We have enjoyed your roast beef, and this day began on the roast veal. All agree that they are both the best that ever were of the kind. Your citizens, that have their dinners hot and hot, know nothing of good eating. We find it in much greater perfection when the kitchen is four score miles from the dining room.

The apples are extremely welcome, and do bravely to eat after our salt pork; the minced pies are not yet come to hand, but I suppose we shall find them among the things expected up from Bethlehem on Tuesday; the capillaire is excellent, but, none of us having taken cold as yet, we have only tasted it.

As to our lodging, it is on deal featherbeds, in warm blankets, and much more comfortable than when we lodged at our inn the first night after we left home; for, the woman being about to put very damp sheets on the bed, we desired her to air them first; half an hour afterwards she told us the bed was ready, and the sheets *well aired*. I got into bed, but jumped out immediately, finding them as cold as death, and partly frozen. She had *aired* them indeed, but it was out upon the hedge. I was forced to wrap myself up in my great coat and woollen trowsers. Every thing else about the bed was shockingly dirty.

As I hope in a little time to be with you and my family, and chat things over, I now only add that I am, dear Debby, your affectionate husband,

B. FRANKLIN.

CXXXII.

TO A FRIEND.¹

GNADENHUTTEN, 25 January, 1756.

DEAR SIR:—We got to Hays's the same evening we left you, and reviewed Craig's company by the way. Much of the next morning was spent in exchanging the bad arms for the good. Wayne's company having joined us, we that night reached Uplinger's, where we got into good quarters, and Saturday morning we began to march towards Gnadenhutten, and proceeded nearly two miles; but it seeming to set in for a rainy day, the men unprovided with great coats, and many unable to secure effectually their arms from the wet, we thought it advisable to face about, and return to our former quarters, where the men might dry themselves and lie warm; whereas, had they proceeded, they would have come in wet to Gnadenhutten, where shelter and opportunity of drying themselves that night were uncertain. In fact, it rained all day, and we were all pleased that we had not proceeded.

The next day, being Sunday, we marched hither, where we arrived about two o'clock in the afternoon, and before five had enclosed our camp with a strong

¹ This letter was probably directed to one of the commissioners, but the name of the individual is not known.

breastwork musket-proof; and, with the boards brought here before by my order from Dunker's Mill, we got ourselves under some shelter from the weather. Monday was so dark, with a thick fog all day, that we could neither look out for a place to build, nor see where materials were to be had. Tuesday morning we looked round us, pitched on a place, and marked out our fort on the ground. By three in the afternoon the logs were all cut, and many of them hauled to the spot, the ditch dug to set them in three feet deep, and many were pointed and set up. The next day we were hindered by rain most of the day. Thursday we resumed our work, and before night were perfectly well enclosed; and on Friday morning, the stockade was finished and part of the platform within erected, which was completed next morning, when we dismissed Foulke's and Wetherhold's companies, and sent Hays down for a convoy of provisions. This day we hoisted the flag, made a general discharge of our pieces, which had been long loaded, and of our two swivels, and named the place *Fort Allen* in honor of our old friend. It is one hundred and twenty-five feet long, and fifty wide; the stockades most of them a foot thick, three feet in the ground and twelve feet out, pointed at the top.

This is an account of our week's work, which I thought might give you some satisfaction. Foulke is gone to build another fort between this and Schuylkill fort, which I hope will be finished (as Trexler is to join him) in a week or ten days, as soon as Hays returns. I shall detach another party to erect another

at Surfass's, which I hope may be finished in the same time, and then I suppose end my campaign, God willing, and do myself the pleasure of seeing you on my return. I can now add no more than that I am with great esteem and affection, &c.,

B. FRANKLIN.

CXXXIII.

TO ROBERT HUNTER MORRIS, GOVERNOR OF PENNSYLVANIA.

FORT ALLEN, AT GNADENHUTTEN, 26 January, 1756.

SIR :—We left Bethlehem the 16th instant, with Foulke's company forty-six men, the detachment of McLaughlin's twenty, and seven wagons laden with stores and provisions. We got that night to Hays's quarters, where Wayne's company joined us from Nazareth. The next day we marched cautiously through the gap of the mountain, a very dangerous pass, and got to Uplinger's, twenty-one miles from Bethlehem, the roads being bad and the wagons moving slowly.

This present Monday we are erecting a third house in the fort to accommodate the garrison. As soon as Captain Hays returns with the convoy of stores and provisions, which I hope may be to-morrow, I purpose to send Arndt and Hays to join Captain Trump in erecting the middle fort there, purposing to remain here between them and Foulke, ready to assist and supply both, as occasion may require; and I hope in a week or ten days, weather favoring, that those two forts may be finished, the line of forts com-

pleted and garrisoned, the rangers in motion, and the intermediate guards and watches disbanded, unless they are permitted and encouraged to go after the enemy to the Susquehanna.

At present the expense in this county is prodigious. We have on foot and in pay the following companies, viz.: Trump's, consisting of fifty men; Aston's, fifty; Wayne's, fifty-five; Foulke's, forty-six; Trexler's, forty-eight; and Wetherhold's, forty-four—without the Fork; Arndt's, fifty; Craig's, thirty; and Martin's, thirty—in the Irish settlements; Van Elten's, thirty—at Minisink; Hays's, forty-five; detachment of McLaughlin's, twenty; Parsons's, twenty-four—at Easton; total, five hundred and twenty-two.

This, Sir, is a particular account of our transactions, and the present state of affairs in this county. I am glad to learn, by your favor of the 21st, just received, that you have thoughts of coming to Bethlehem, as I may hope for an opportunity of waiting upon your Honor there, after our works are finished, and of communicating every thing more fully. I now only add, that I am, with dutiful respect, Sir, &c.,

B. FRANKLIN.¹

¹ He wrote to Mr. Horsefield, January 25th: "Foulke with his company marches this day to build another fort between this and Fort Lebanon in the Forks of the Schuylkill. He is to be assisted by Trexler's company, and a detachment of Wetherhold's, which also leaves us this day. My son, with Hays's company and Arndt's, marches in a few days to Surfass's place (where Trump is also expected), to erect another fort between this and Fort Hamilton near Brodhead's. I purpose to remain here between them till

both are finished, with Wayne and the detachment of Davis's, that I may be able to supply and assist on either side as occasion requires. This is the present state of our affairs, of which please to inform our friends, as I cannot now write to them."

Again, to Mr. Samuel Rhoads, January 26th: "We have built one pretty strong fort, and by the end of next week, or in ten days, hope to finish two more, one on each side of this, and at fifteen miles' distance. These, I suppose, will complete the projected

CXXXIV.

TO MRS. DEBORAH FRANKLIN.

FORT ALLEN, AT GNADENHUTTEN, 30 January, 1756.

MY DEAR CHILD :—Every other day, since we have been here, it has rained, more or less, to our no small hindrance. It rained yesterday, and now again to-day, which prevented our marching ; so I will sit down half an hour to confer a little with you.

All the things you sent me, from time to time, are safely come to hand, and our living grows every day more comfortable ; yet there are many things we still want, but do not send for them, as we hope our stay here will not be long.

I thought to have wrote you a long letter, but here comes in a number of people from different parts, that have business with me, and interrupt me ; we have but one room, and that quite public ; so I can only add, that I have just received yours, Sally's, and Grace's letters, of the 25th, with one from Mr. Hughes, and one from Mr. Thomson. Present my respects to those gentlemen (and excuse my not writing, as I have nothing material, and am much hurried), and love to all our friends and neighbours. Billy presents his duty to you, and love to his sister ; all the gentlemen their compliments ; they drink

line from Delaware to the Susquehanna. I then purpose, God willing, to return homewards, and enjoy the pleasures I promise myself, of finding my friends well."

In another letter to Mr. Horsefield, written on the 28th, he said : "I have the pleasure to inform you, that

the six wagons are just arrived, and I suppose all right, though I have not yet had time to examine the contents. There are ten Lehigh people buzzing in both ears while I write ; so can only add my thanks for your care and readiness to serve the province."

your health at every meal, having always something on the table to put them in mind of you.

I found, among the newspapers, Mr. Shoen's bills of exchange, which should not have been sent up here ; I suppose it was by mistake, and mention it, that you need not be troubled to look more for them.

I am, dear girl, your loving husband,

B. FRANKLIN.

CXXXV.

TO MRS. DEBORAH FRANKLIN.

FORT ALLEN, 31 January, 1756.

MY DEAR :—I wrote a line to you yesterday, and, having this opportunity, write another, just to let you know that we all continue well, and much the better for the refreshments you have sent us ; in short, we do very well ; for, though there are a great number of things, besides what we have, that used to seem necessary to comfortable living, yet we have learned to do without them.

Mr. Beatty is a very useful man here, and the Doctor another. Besides their services to the public, they are very agreeable companions to me. They, with Captain Clapham, Mr. Edmond, and the rest of our company, present their hearty respects to you for the *goodies*. Billy presents his duty to you and his grandmother, and love to his sister. Distribute my compliments among our acquaintance, and hearty love to all friends. The bearer waits, so that I cannot write to my dear Sally. I am, dear girl, your loving husband,

B. FRANKLIN,

CXXXVI.

TO MRS. JANE MECOM.

PHILADELPHIA, 12 February, 1756.

DEAR SISTER :—I condole with you on the loss of our dear brother.¹ As our number grows less, let us love one another proportionably more.

I am just returned from my military expedition, and now my time is taken up in the Assembly. Providence seems to require various duties of me. I know not what will be next ; but I find, the more I seek for leisure and retirement from business, the more I am engaged in it. Benny, I understand, inclines to leave Antigua. He may be in the right. I have no objection. My love to brother and to your children. I am, dearest sister, your affectionate brother,

B. FRANKLIN.

CXXXVII.

TO MISS E. HUBBARD.²

PHILADELPHIA, 23 February, 1756.

— I condole with you. We have lost a most dear and valuable relation. But it is the will of God and nature that these mortal bodies be laid aside when the soul is to enter into real life. This is rather an embryo state, a preparation for living. A man is not completely born until he be dead. Why then should we grieve that a new child is born among the im-

¹ John Franklin, who died at Boston, in January, 1756, at the age of sixty-five.

² John Franklin married a second

wife, by the name of Hubbard, a widow. Miss E. Hubbard, to whom this letter was addressed, was her daughter by a former marriage.

mortals, a new member added to their happy society?

We are spirits. That bodies should be lent us, while they can afford us pleasure, assist us in acquiring knowledge, or in doing good to our fellow creatures, is a kind and benevolent act of God. When they become unfit for these purposes, and afford us pain instead of pleasure, instead of an aid become an incumbrance, and answer none of the intentions for which they were given, it is equally kind and benevolent that a way is provided by which we may get rid of them. Death is that way. We ourselves, in some cases, prudently choose a partial death. A mangled painful limb which cannot be restored we willingly cut off. He who plucks out a tooth parts with it freely, since the pain goes with it; and he who quits the whole body, parts at once with all pains and possibilities of pains and diseases which it was liable to or capable of making him suffer.

Our friend and we were invited abroad on a party of pleasure, which is to last for ever. His chair was ready first, and he is gone before us. We could not all conveniently start together; and why should you and I be grieved at this, since we are soon to follow, and know where to find him? Adieu.

B. FRANKLIN.¹

¹ On a similar occasion he wrote to his sister, a few days afterwards, as follows: "It is remarkable that so many breaches by death should be made in our family in so short a space. Out of seventeen children that our father had, thirteen lived to grow up and settle in the world, I remember

these thirteen (some of us then very young) all at one table, when an entertainment was made at our house, on occasion of the return of our brother Josiah, who had been absent in the East Indies, and unheard of for nine years. Of these thirteen, there now remain but three. As our number

CXXXVIII.

TO MRS. DEBORAH FRANKLIN.

FREDERICKTOWN, VIRGINIA, 21 March, 1756.

MY DEAR CHILD :—We got here yesterday afternoon, and purpose sailing to-day if the wind be fair. Peter was taken ill with a fever and pain in his side before I got to Newcastle. I had him bled there, and put him into the chair wrapped up warm, as he could not bear the motion of the horse, and got him here pretty comfortably. He went immediately to bed, and took some camomile tea, and this morning is about again and almost well. I leave my horses at Mr. Milliken's, a gentleman that lives on Bohemia River.

Among the government orders I left with you, are two written ones drawn on Mr. Charles Norris for considerable sums. You did not tell me, when I asked you, what money you had in hand. If you want before my return, present one of those orders to Mr. Norris, and he will pay the whole or a part, as you have occasion. Billy will also pay you some money, which I did not care to take with me from Newcastle. Be careful of your accounts, particularly about the lottery affairs. My duty to mother, and love to Sally, Debby, Gracy, &c., not forgetting the

diminishes, let our affection to each other rather increase ; for, besides its being our duty, it is our interest, since the more affectionate relations are to each other, the more they are respected by the rest of the world."

Again, speaking of the death of an acquaintance, he wrote : " Your neighbour must have been pretty well ad-

vanced in years when he died. I remember him a young man when I was a very young boy. In looking back, how short the time seems ! I suppose that all the passages of our lives that we have forgotten, being so many links taken out of the chain, give the more distant parts leave, as it were, to come apparently nearer together."

Goody. Desire Dr. Bond to send me some of those pills by post. I forgot to take any with me. Let Mr. Parker know I received the money he sent me on the post-office and money-paper accounts. I forgot to write it to him, though I fully intended it. If there is peace I shall probably not come home so soon as I purposed to do in case the ships from England bring a declaration of war, or in case the uncertainty continues. I am, my dear child, your loving husband,

B. FRANKLIN.

CXXXIX.

TO MRS. DEBORAH FRANKLIN.

WILLIAMSBURG, 30 March, 1756.

MY DEAR CHILD :—I wrote to you *via* New York the day after my arrival, acquainting you that I had a fine journey and passage down the Bay, being but four days from Philadelphia to Colonel Hunter's, though stopped near a day on the road.¹ I have been well ever since, quite clear of the dizziness I complained of, and as gay as a bird, not beginning yet to long for home, the worry of perpetual business being yet fresh in my memory. Mr. Hunter is much better than I expected to find him, and we are daily employed in settling our affairs. About the end of the week we are to take a tour into the country. Virginia is a pleasant country, now in full spring; the people obliging and polite. I shall return in the

¹ Franklin and Colonel Hunter were at this time jointly postmasters-general of the colonies, and the busi-

ness of the post-office seems to have been the object of this journey to Virginia.

man-of-war to New York with Colonel Hunter and his lady ; at least, this is proposed ; but, if a more convenient opportunity offers, perhaps I may not stay so long as the end of the next month, when that ship is to sail. I am, my dear Debby, your loving husband,

B. FRANKLIN.¹

CXL.

TO JOSEPH HUEY.

PHILADELPHIA, 6 June, 1756.²

SIR :—I received your kind letter of the 2d inst., and am glad to hear that you increase in strength. I hope you will continue mending till you recover your former health and firmness. Let me know if you still use the cold bath, and what effect it has.

As to the kindness you mention, I wish it could have been of more service to you. But if it had, the only thanks I should desire is, that you would always be equally ready to serve any other person that may need your assistance, and so let good offices go round, for mankind are all of a family.

For my own part, when I am employed in serving others, I do not look upon myself as conferring

¹ On the 10th of June he wrote from Philadelphia to William Parsons : " It is now a long time since I had the pleasure of a line from you. I am now returned from Virginia, where I was near two months. I should be glad to learn from you the present state of the forces in your county, and of the people. If in any thing I can serve you, command freely your old friend."

² Mr. Sparks publishes this letter as addressed to George Whitefield under date of June 6, 1753. In a note he says : " The above letter has often

been printed, and always, I believe, as having been written to Whitefield, but among the author's MSS. I find the first draft, with the following indorsement in Franklin's handwriting : '*Letter to Joseph Huey.*'" Aside from the intrinsic improbability of Franklin's preaching such a sermon as this to Whitefield, there is no good reason to doubt that it was written to the man to whom it was addressed. The first draft, from which we print, is in the American Philosophical Society in Philadelphia.—EDITOR.

favours, but as paying debts. In my travels and since my settlement I have received much kindness from men, to whom I shall never have any opportunity of making the least direct return, and numberless mercies from God, who is infinitely above being benefited by our services. These kindnesses from men I can therefore only return on their fellow-men ; and I can only show my gratitude for those mercies from God, by a readiness to help his other children and my brethren. For I do not think that thanks and compliments tho' repeated weekly, can discharge our real obligations to each other, and much less those to our Creator.

You will see in this my notion of good works, that I am far from expecting (as you suppose) that I shall ever merit heaven by them. By heaven we understand a state of happiness, infinite in degree and eternal in duration. I can do nothing to deserve such reward. He that for giving a draught of water to a thirsty person should expect to be paid with a good plantation, would be modest in his demands, compared with those who think they deserve heaven for the little good they do on earth. Even the mixed, imperfect pleasures we enjoy in this world are rather from God's goodness than our merit ; how much more such happiness of heaven. For my own part, I have not the vanity to think I deserve it, the folly to expect it, nor the ambition to desire it ; but content myself in submitting to the will and disposal of that God who made me, who hitherto preserv'd and bless'd me, and in whose fatherly goodness I may well con-

fide, that he will never make me miserable, and that even the afflictions I may at any time suffer shall tend to my benefit.

The faith you mention has doubtless its use in the world ; I do not desire it to be diminished, nor would I endeavour to lessen it in any man. But I wish it were more productive of good works than I have generally seen it. I mean real good works, works of kindness, charity, mercy, and publick spirit ; not holiday-keeping, sermon reading or hearing, performing church ceremonies, or making long prayers, filled with flatteries and compliments,—despis'd even by wise men, and much less capable of pleasing the Deity. The worship of God is a duty, the hearing and reading of sermons may be useful ; but if men rest in hearing and praying, as too many do, it is as if a tree should value itself in being water'd and putting forth leaves, tho' it never produc'd any fruit.

Your great Master tho't much less of these outward appearances and professions than many of the modern disciples. He preferr'd the doers of the word to the mere hearers ; the Son that seemingly refus'd to obey his father and yet perform'd his command, to him that profess'd his readiness but neglected the work ; the heretical but charitable Samaritan, to the uncharitable tho' orthodox priest and sanctified Levite ; and those who gave food to the hungry, drink to the thirsty, raiment to the naked, entertainment to the stranger, and relief to the sick, &c., tho' they never heard of his name, he declares shall in the last day be accepted, when those who cry Lord, Lord, who value themselves

on their faith, tho' great enough to perform miracles, but have neglected good works, shall be rejected. he professed that he came not to call the righteous but sinners to repentance ; which imply'd his modest opinion that there were some in His time so good that they need not hear even him for improvement ; but nowadays we have scarce a little parson, that does not think it the duty of every man within his reach to sit under his petty ministrations, and that whoever omits them¹ [all the rest of this letter is torn out.]

[On the back of this letter is the following endorsement.]

In writing to his brother, August 6, 1747, Franklin says : " I am glad to hear that Mr. Whitefield is safe arrived, and recovered his health. He is a good man, and I love him."

CXLI.

TO MRS. JANE MECOM.

NEW YORK, 28 June, 1756.

DEAR SISTER :—I received here your letter of extravagant thanks, which put me in mind of the story of the member of Parliament, who began one of his speeches with saying he thanked God that he was born and bred a Presbyterian ; on which another took leave to observe, that the gentleman must needs be of a most grateful disposition, since he was thankful for such very small matters.

You desire me to tell you what I know about Benny's removal, and the reasons of it. Some time last year, when I returned from a long journey, I found a

¹ Mr. Sparks concludes this letter with the words " offends God." That is a very satisfactory conclusion, but we have no evidence that it was Franklin's.

letter from him, which had been some time unanswered, and it was some considerable time afterwards before I knew of an opportunity to send an answer. I should first have told you, that when I set him up at Antigua, he was to have the use of the printing-house on the same terms with his predecessor, Mr. Smith ; that is, allowing me one third part of the profits. After this, finding him diligent and careful, for his encouragement, I relinquished that agreement, and let him know, that as you were removed into a dearer house, if he paid you yearly a certain sum, I forget what it was, towards discharging your rent, and another small sum to me, in sugar and rum for my family use, he need keep no farther accounts of the profits, but should enjoy all the rest himself. I cannot remember what the whole of both payments amounted to, but I think they did not exceed twenty pounds a year.

The truth is, I intended, from the first, to give him that printing-house ; but as he was young and inexperienced in the world, I thought it best not to do it immediately, but to keep him a little dependent for a time, to check the flighty unsteadiness of temper, which, on several occasions, he had discovered ; and what I received from him, I concluded to lay out in new letters (or types), that, when I should give it to him entirely, it might be worth his acceptance ; and if I should die first, I put it in my will, that the letters should be all new cast for him.

This proposal of paying you and me a certain annual sum did not please him ; and he wrote to desire

I would explicitly tell him how long that annual payment was to continue ; whether, on payment of that, all prior demands I had against him, for the arrears of our first agreement, were likewise cancelled ; and finally insisted, that I would name a certain sum that I would take for the printing-house, and allow him to pay it off in parts as he could, and then the yearly payments to cease ; for, though he had a high esteem for me, yet he loved freedom, and his spirit could not bear dependence on any man, though he were the best man living,

This was the letter, which casually remained, as I said, so long unanswered ; at which he took farther offence ; and before I could answer it, I received another from him, acquainting me that he had come to a resolution to remove from the Island ; that his resolution was fixed, and nothing that could be said to him should move or shake it ; and he proposed another person to me, to carry on the business in his room. This was immediately followed by another and a third letter, to the same purpose, all declaring the inflexibility of his determination to leave the Island, but without saying where he proposed to go, or what were his motives. So I wrote him, that I would not attempt to change his resolutions ; that I made no objections to his quitting, but wished he had let me know where he was going ; that, as to the person he recommended to succeed him, I had kept the office there after Mr. Smith's decease, in hopes it might be of use to him (Benny). I did not incline to be concerned with any other there. However, if the

person would buy it, I named the price ; if not, I directed it to be packed up and sent home. All I desired of him was to discharge what he owed to Mr. Strahan, bookseller in London, one of my friends, who had credited him on my recommendation.

By this post I received the enclosed letter, and understand the things are all arrived. I shall be very glad to hear he does better in another place, but I fear he will not for some years be cured of his fickleness, and get fixed to any purpose ; however, we must hope for the best, as with this fault he has many good qualities and virtues.

My love to brother and children, and to all that love you. I am, dear sister, your affectionate brother,

B. FRANKLIN.

CXLII.

TO WILLIAM PARSONS.

NEW YORK, 28 June, 1756.

DEAR FRIEND :—I have received here your favor of the 19th instant, with a copy of your remarks on reviewing the forts, for which I am much obliged to you ; and I hope the governor and commissioners will immediately take the necessary measures to remedy every thing that you find amiss. I think you hazarded yourself with too small escorts, and am glad you got safe through. It appears plainly that it will be of great use to review the forts frequently. The expense must be inconsiderable compared to the advantages and security that may be derived from it.

Great part of the British regiments are arrived

here. The men are all in health, and look exceedingly well. What will be undertaken this summer is, I believe, unknown, or uncertain till the general's arrival. Some of the officers think this year will be chiefly spent in preparation for the next. Others imagine there will be an accommodation. For my part, I can make no judgment. This only I can plainly see, that New York is growing immensely rich by money brought into it from all quarters for the pay and subsistence of the troops. General Shirley, it is said, is to go home in the same ship that brings Lord Loudoun, and to be made one of the Lords of Trade. The Indians continue to scalp now and then a man too close to Albany, Oswego, and the camps. The New England forces are not yet complete. Those colonies have overdone themselves, and undertaken too much; more than they are able to bear or perform.

With great esteem, I am, dear friend, affectionately
yours,

B. FRANKLIN.

CXLIII.

TO GEO. WHITEFIELD.

NEW YORK, July 2, 1756.

DEAR SIR:—I received your favour of the 24th of February with great pleasure, as it informed me of your welfare, and expressed your continued regard for me. I thank you for the pamphlet you enclosed to me.¹ As we have just observed a provincial fast on the same occasion, I thought it very seasonable

¹ Doubtless, Whitefield's "Short Address to Persons of all Denominations,"

to be published in Pennsylvania; and accordingly reprinted it immediately.

You mention your frequent wish that you were a chaplain to the American army. I sometimes wish that you and I were jointly employed by the crown to settle a colony on the Ohio. I imagine that we could do it effectually, and without putting the nation to much expense; but I fear we shall never be called upon for such a service. What a glorious thing it would be to settle in that fine country a large, strong body of religious and industrious people! What a security to the other colonies and advantage to Britain, by increasing her people, territory, strength, and commerce! Might it not greatly facilitate the introduction of pure religion among the heathen, if we could, by such a colony, show them a better sample of Christians than they commonly see in our Indian traders?—the most vicious and abandoned wretches of our nation! Life, like a dramatic piece, should not only be conducted with regularity, but, methinks, it should finish handsomely. Being now in the last act, I begin to cast about for something fit to end with. Or, if mine be more properly compared to an epigram, as some of its lines are but barely tolerable, I am very desirous of concluding with a bright point. In such an enterprise, I could spend the remainder of life with pleasure; and I firmly believe God would bless us with success, if we undertook it with a sincere regard to His honour, the service of our gracious king, and (which is the same thing) the public good.

I thank you cordially for your generous benefactions to the German schools. They go on pretty well; and will do better, when Mr. Smith, who has at present the principal charge of them, shall learn to mind party-writing and party politics less, and his proper business more; which, I hope, time will bring about.

I thank you for your good wishes and prayers; and am, with greatest esteem and affection, dear Sir, your most obedient humble servant,

BENJAMIN FRANKLIN.

My best respects to Mrs. Whitefield.

CXLIV.

TO THOMAS POWNALL.¹

PHILADELPHIA, 19 August, 1756.

SIR:—I have done myself the honor to write you twice since my return, relating to the proposed road; but have as yet had no line from you.

Enclosed I send you a copy of the late treaty, or conference, at Easton, with a letter from Bishop

¹ Thomas Pownall, commonly called Governor Pownall, came first to America with Sir Danvers Osborn, Governor of New York, in 1753. His brother, John Pownall, was one of the secretaries to the Board of Trade; and Thomas Pownall had made himself well acquainted with American affairs. He returned to England in February, 1756, but came back to America again with the Earl of Loudoun, who landed at New York on the 23d of July following. In the next year, 1757, he succeeded General Shirley as governor of Massachusetts. At later periods he was lieutenant-

governor of New Jersey, and governor of South Carolina, though it would seem that he remained but a short time in either of these two last stations. He was a member of Parliament from 1768 to 1780, and opposed with much boldness and ability the ministerial measures against the colonies. He wrote and published various tracts relating to America, the most valuable of which is his treatise entitled, "Administration of the Colonies," which passed through several editions. He died in 1805, at the advanced age of eighty-three years.—SPARKS.

Spangenberg to Mr. Norris, by which you will see nothing is likely to come of the treaty. The Indians are preparing to continue the war, and we see of how little consequence Sir William Johnson's treaty has been in our behalf. For my own part, I make no doubt but the Six Nations have privily encouraged these Indians to fall upon us. They have taken no step to defend us, as their allies, nor to prevent the mischief done us. I look upon the application made through Sir William Johnson to these nations to procure us peace, as the most unfortunate step we ever took ; for we tied up the hands of our people, till we heard the result of that application. The affair was drawn out to great length of time, and in the mean while our frontier people were continually butchered, and at last either dispersed or dispirited. In short, I do not believe we shall ever have a firm peace with the Indians till we have well drubbed them.

Our frontiers are greatly distressed, as you will see by the enclosed letters. The people are also distressed by the enlisting of their servants ; but, if Lord Loudoun would order the recruits, now near five hundred, to march up and take post on the frontiers, in the forts there, where they would find good barracks, and would be of great use to the inhabitants, it would be a most acceptable thing to the whole province. In this Mr. Norris joins with me, as well as in compliments to his Lordship and yourself.

The Assembly are met, and in a very good disposition toward the service ; but, the new governor

being hourly expected, nothing can be done till his arrival. He is, we hear, on the road from York. I am, Sir, &c. B. FRANKLIN.

CXLV.

TO GEORGE WASHINGTON.¹

PHILADELPHIA, 19 August, 1756.

SIR:—I have your favors of July 23d and August 3d, but that you mention to have wrote by Mr. Balfour is not come to hand. I forwarded the packet enclosed in that of July 23d, as directed, and shall readily take care of any other letters from you, that pass through my hands. The post, between this place and Winchester, was established for the accommodation of the army chiefly, by a vote of our Assembly. They are not willing to continue the charge, and it must, I believe, be dropped, unless your Assembly and that of Maryland will contribute to support it, which, perhaps, is scarce to be expected.

I am sorry it should be laid down, as I shall myself be a loser in the affair of newspapers.² But the letters per post by no means defray the expense. If you can prevail with your Assembly to pay the rider from Winchester to Carlisle, I will endeavour to persuade ours to continue paying the rider from Carlisle

¹ At this time commander-in-chief of the Virginia forces raised to protect the frontiers from the Indians and French. His head-quarters were at Winchester. Franklin, in his capacity of postmaster-general for the colonies, had, the year previous,

during Braddock's march, arranged a post between Philadelphia and Winchester, in consequence of a vote of the Pennsylvania Assembly.

² At this time Franklin printed and published a newspaper in Philadelphia.

hither. My agreement with the house was, to carry all public despatches gratis, to keep account of postage received for private letters, and charge the expense of riders and offices; and they were to pay the balance. I am, Sir, with great esteem and respect, &c.,

B. FRANKLIN.

P. S.—We have just received news that the Delaware Indians, with whom we treated lately at Easton, have burnt the goods they received as presents, and resolved to continue the war.¹

CXLVI.

TO MRS. DEBORAH FRANKLIN.

EASTON, 13 November, 1756.

MY DEAR CHILD :—I wrote to you a few days since by a special messenger, and enclosed letters for all our wives and sweethearts; expecting to hear from you by his return, and to have the northern newspapers and English letters per the packet; but he is just now returned without a scrap for poor us. So I

¹ Though Franklin was actively engaged in these important affairs, which had an immediate claim upon his exertions, he took a not less zealous or liberal part in promoting objects of general utility: as is manifest by the following extract from a letter written to him by Mr. William Shipley, dated London, September 1, 1756. Mr. Shipley was secretary to the society, in whose behalf he wrote.

"Sir, I am ordered to acquaint you that the Society for the Encouragement of Arts, Manufactures, and Commerce have unanimously elected you a corresponding member; and it gives the Society a singular pleasure

to place upon their list a gentleman whose public spirit and uncommon abilities are so universally known and so deservedly esteemed. They are glad to find their plan approved by you, and will always give great attention to what you shall judge most proper for their encouragement in America, which they hope from time to time you will please to let them know. They return you thanks for your generous present of twenty guineas, which their treasurer has received by the hands of Mr. Collinson. They earnestly desire your correspondence, information, and advice."

had a good mind not to write to you by this opportunity ; but I never can be ill natured enough even when there is the most occasion. The messenger says he left the letters at your house, and saw you afterwards at Mr. Duché's, and told you when he would go, and that he lodged at Honey's, next door to you, and yet you did not write ; so let Goody Smith give one more just judgment, and say what should be done to you. I think I won't tell you that we are well, nor that we expect to return about the middle of the week, nor will I send you a word of news ; that 's poz.

My duty to mother, love to the children, and to Miss Betsey and Gracy, &c., &c. I am your *loving* husband,

B. FRANKLIN.

P. S.—I have *scratched out the loving words*, being writ in haste by mistake, when I *forgot I was angry*.¹

¹ When the above letter was written, the author was at Easton, in Pennsylvania, attending a conference with the Indians. The successes of the French on the frontiers, and the disasters which followed Braddock's defeat, had excited the Indians to hostilities ; and murders and other outrages had been committed by them even in the heart of the province. To counteract the influence of the French and bring the Indians to a better temper, it was deemed expedient to hold an amicable conference with some of their chiefs. Governor Denny was present in person, and also William Logan and Richard Peters, on the part of the Council ; and Benjamin Franklin, Joseph Fox, William Masters, and John Hughes, as delegates from the Assembly. The conference was opened at Easton on the 8th of November. Teedyuscung, a king of the Delawares, residing at Wyoming, was the princi-

pal speaker for the Indians. He explained the reasons of the recent hostilities, but said he was now at peace, and wished to remain so. He promised to return all the prisoners, and demanded that the Indians who had been taken should likewise be sent back to him. He also complained of wrongs which he had suffered.

"I do not want," said he, "to compel any of the Indians to return or to stay against their will. If they are inclined to stay and live among the English, I am quite willing they should go back again ; but I want that they should come and see me, that thereby I may convince their relations and the other nations afar off, that they are not servants, but free people.

"The kings of England and France," he added, "have settled or wrought this land so as to coop us up, as if in a pen. This very ground

CXLVII.

TO EDWARD AND JANE MECOM.

PHILADELPHIA, 30 December, 1756.

DEAR BROTHER AND SISTER:—You will receive this by the hand of your son Benjamin, on whose safe return from the West Indies I sincerely congratulate you.

He has settled accounts with me, and paid the balance honorably. He has also cleared the old printing-house to himself, and sent it to Boston, where he

that is under me" (striking it with his foot) "was my land and inheritance, and was taken from me by fraud; when I say this ground, I mean all the land lying between Tohiccon Creek and Wyoming on the River Susquehanna. The Proprietaries, who have purchased their lands from us cheap, have sold them too dear to poor people, and the Indians have suffered for it. It would have been more prudent for the Proprietaries to sell the lands cheaper, and to have given it in charge to the people, who bought from them, to use the Indians with kindness on that account."

The governor asked him what he meant by fraud.

Teedyuscung replied: "When one man had formerly liberty to purchase lands, and he took the deeds from the Indians for it, and then died; after his death, the children forge the deed for the true one, with the same Indian names to it, and thereby take lands from the Indians which they never sold: this is fraud. Also, when one king has land beyond the river, and another king has land on this side, both bounded by rivers, mountains, and springs, which cannot be moved, and the Proprietaries, greedy to purchase lands, buy of one king what belongs to another; this is likewise fraud.

"All the land extending from To-

hiccon Creek, over the great mountain to Wyoming, has been taken from me by fraud; for, when I had agreed to sell the land to the old Proprietary by the course of the river, the young Proprietaries came, and got it run by a straight course by the compass, and by that means took in double the quantity intended to be sold."

Though these charges were not allowed to be correct, yet the commissioners thought it advisable to put an end to the complaints of the Indians by satisfying their claims, and they offered to Teedyuscung a suitable compensation. He declined accepting it on the ground that other tribes besides his own were concerned and must be consulted, and concluded by saying that in the spring he would bring them together for another treaty.

The manuscript minutes of this singular conference have been preserved in the archives of the American Philosophical Society. The commissioners, who attended the conference on the part of the Assembly, were not satisfied with the manner in which the minutes were reported to that body by the governor, and they signed jointly an explanatory paper, which was probably drawn up by Franklin, and which is printed in the "Votes and Proceedings of the Assembly," under the date of January 29, 1757.—SPARKS.

purposes to set up his business, together with book-selling, which, considering his industry and frugality, I make no doubt will answer. He has good credit and some money in England, and I have helped him by lending him a little more; so that he may expect a cargo of books, and a quantity of new letter, in the spring; and I shall from time to time furnish him with paper. We all join in love to you and yours. I am your loving brother,

B. FRANKLIN.

CXLVIII.

PLAN

FOR SETTLING TWO WESTERN COLONIES IN NORTH AMERICA, WITH REASONS FOR THE PLAN.¹

The great country back of the Appalachian Mountains, on both sides of the Ohio, and between that

¹ Dr. Franklin was early possessed of the belief, that great advantage would redound to the English colonies on the sea-board by settlements beyond the Alleghanies under governments distinctly organized. Such settlements would not only rapidly increase in population, thereby strengthening the power of the whole, but would serve as a barrier to the other colonies against the Indians and French, who, in time of war, made descents upon the frontiers, kept the people in alarm, and caused great expense in raising troops and supporting an army to repel their invasions. He pursued this favorite object for many years; and after he went to England a company was formed, under his auspices, who petitioned for a grant to settle a colony west of the Allegany Mountains. Many obstacles were encountered, but the application was at last successful. The scheme was prevented from

being carried into effect by the troubles immediately preceding the revolution.

The following paper was probably written shortly after the Albany Convention, in 1754, at the request of Governor Pownall, who had a project for settling what he called "barrier colonies." He presented a memorial to the Duke of Cumberland on this subject in the year 1756, in which he says:

"If the English would advance one step further, or cover themselves where they are, it must be at once, by one large step over the mountains, with a numerous and military colony. Where such should be settled, I do not take upon me to say; at present I shall only point out the measure and the nature of it, by inserting two schemes, one of Dr. Franklin's, the other of your memorialist; and if I might indulge myself with scheming, I should imagine that two such were sufficient, and only requisite and

river and the Lakes, is now well known, both to the English and French, to be one of the finest in North America, for the extreme richness and fertility of the land, the healthy temperature of the air, and mildness of the climate; the plenty of hunting, fishing, and fowling; the facility of trade with the Indians, and the vast convenience of inland navigation or water-carriage by the Lakes and great rivers, many hundreds of leagues around.

From these natural advantages it must undoubtedly (perhaps in less than another century) become a populous and powerful dominion¹; and a great accession of power either to England or France.

The French are now making open encroachments on those territories, in defiance of our known rights; and, if we longer delay to settle that country, and suffer them to possess it, these *inconveniences and mischiefs* will probably follow:

1. Our people, being confined to the country between the sea and the mountains, cannot much more increase in number, people increasing in proportion to their room and means of subsistence.

2. The French will increase much more, by that

proper; one at the back of Virginia, filling up the vacant space between the Five Nations and southern confederacy, and connecting into one system our barrier; the other somewhere in the Cohass on Connecticut River, or wherever best adapted to cover the New England colonies. These, with the little settlements mentioned above in the Indian countries, complete my idea of this branch."—"Administration of the Colonies," 4th ed., Appendix., p. 48.

When this memorial, with Franklin's plan, was presented, the whole country was too much involved in the war with the French and Indians, to allow any scheme of this sort to be matured; the peace followed, when the occasion for them was less pressing; and the revolution opened the way to other methods of attaining the same object.—SPARKS.

¹ This prediction has been verified in a much less time than even the author anticipated.—EDITOR.

acquired room and plenty of subsistence, and become a great people behind us.

3. Many of our debtors and loose English people, our German servants, and slaves, will probably desert to them, and increase their numbers and strength, to the lessening and weakening of ours.

4. They will cut us off from all commerce and alliance with the western Indians, to the great prejudice of Britain, by preventing the sale and consumption of its manufactures.

5. They will both in time of peace and war (as they have always done against New England) set the Indians on to harass our frontiers, kill and scalp our people, and drive in the advanced settlers ; and so, in preventing our obtaining more subsistence by cultivating of new lands, they discourage our marriages, and keep our people from increasing ; thus (if the expression may be allowed) killing thousands of our children before they are born.

If two strong colonies of English were settled between the Ohio and Lake Erie, in the places hereafter to be mentioned, these advantages might be expected :

1. They would be a great security to the frontiers of our other colonies, by preventing the incursions of the French and French Indians of Canada, on the back parts of Pennsylvania, Maryland, Virginia, and the Carolinas ; and the frontiers of such new colonies would be much more easily defended, than those of the colonies last mentioned now can be, as will appear hereafter.

2. The dreaded junction of the French settlements in Canada with those of Louisiana would be prevented.

3. In case of a war, it would be easy, from those new colonies, to annoy Louisiana, by going down the Ohio and Mississippi ; and the southern part of Canada, by sailing over the Lakes, and thereby confine the French within narrow limits.

4. We could secure the friendship and trade of the Miamis or Twigtwees (a numerous people consisting of many tribes, inhabiting the country between the west end of Lake Erie, and the south end of Lake Huron, and the Ohio), who are at present dissatisfied with the French and fond of the English, and would gladly encourage and protect an infant English settlement in or near their country, as some of their chiefs have declared to the writer of this memoir. Further, by means of the Lakes, the Ohio, and the Mississippi, our trade might be extended through a vast country, among many numerous and distant nations, greatly to the benefit of Britain.

5. The settlement of all the intermediate lands, between the present frontiers of our colonies on one side, and the Lakes and Mississippi on the other, would be facilitated and speedily executed, to the great increase of Englishmen, English trade, and English power.

The grants to most of the colonies are of long, narrow slips of land, extending west from the Atlantic to the South Sea. They are much too long for their breadth ; the extremes at too great a distance ;

and therefore unfit to be continued under their present dimensions.

Several of the old colonies may conveniently be limited westward by the Allegany or Appalachian mountains, and new colonies formed west of those mountains.

A single old colony does not seem strong enough to extend itself otherwise than inch by inch. It cannot venture a settlement far distant from the main body, being unable to support it ; but if the colonies were united under one governor-general and grand council, agreeably to the Albany plan, they might easily, by their joint force, establish one or more new colonies, whenever they should judge it necessary or advantageous to the interest of the whole.

But if such union should not take place, it is proposed that two charters be granted, *each* for some considerable part of the lands west of Pennsylvania and the Virginia mountains, to a number of the nobility and gentry of Britain ; with such Americans as shall join them in contributing to the settlement of those lands, either by paying a proportion of the expense of making such settlements, or by actually going thither in person, and settling themselves and families.

That by such charters it be granted that every actual settler be entitled to a tract of — acres for himself, and — acres for every poll in the family he carries with him ; and that every contributor of — guineas be entitled to a quantity of acres, equal to the share of a single settler, for every such sum of

guineas contributed and paid to the colony treasurer ; a contributor for — shares to have an additional share *gratis* ; that settlers may likewise be contributors, and have right of land in both capacities.

That as many and as great privileges and powers of government be granted to the contributors and settlers, as his Majesty in his wisdom shall think most fit for their benefit and encouragement, consistent with the general good of the British empire ; for extraordinary privileges and liberties, with lands on easy terms, are strong inducements to people to hazard their persons and fortunes in settling new countries. And such powers of government as (though suitable to their circumstances, and fit to be trusted with an infant colony) might be judged unfit when it becomes populous and powerful, these might be granted for a term only ; as the choice of their own governor for ninety-nine years ; the support of government in the colonies of Connecticut and Rhode Island (which *now* enjoy that and other like privileges) being much less expensive than in the colonies under the immediate government of the crown, and the constitution more inviting.

That the first contributors to the amount of — guineas be empowered to choose a treasurer to receive the contribution.

That no contributions be paid till the sum of — thousand guineas be subscribed.

That the money thus raised be applied to the purchase of the lands from the Six Nations and other Indians, and of provisions, stores, arms, ammunition,

carriages, &c., for the settlers, who, after having entered their names with the treasurer, or person by him appointed to receive and enter them, are, upon public notice given for that purpose, to rendezvous at a place to be appointed, and march in a body to the place destined for their settlement, under the charge of the government to be established over them. Such rendezvous and march, however, not to be directed till the number of names of settlers entered, capable of bearing arms, amount at least to — thousand.

It is apprehended that a great sum of money might be raised in America on such a scheme as this ; for there are many who would be glad of any opportunity, by advancing a small sum at present, to secure land for their children, which might in a few years become very valuable ; and a great number, it is thought, of actual settlers might likewise be engaged (some from each of our present colonies), sufficient to carry it into full execution by their strength and numbers ; provided only, that the crown would be at the expense of removing the little forts the French have erected in their encroachments on his Majesty's territories, and supporting a strong one near the Falls of Niagara, with a few small armed vessels, or half-galleys to cruise on the Lakes.

For the security of this colony in its infancy, a small fort might be erected and for some time maintained at Buffalo Creek on the Ohio, above the settlement ; and another at the mouth of the Tioga, on the south side of Lake Erie, where a port should be

formed and a town erected for the trade of the Lakes. The colonists for *this settlement* might march by land through Pennsylvania.

The river Scioto, which runs into the Ohio about two hundred miles below Logstown, is supposed the fittest seat for the *other colony* ; there being for forty miles on each side of it, and quite up to its heads, a body of all rich land ; the finest spot of its bigness in all North America, and has the particular advantage of sea-coal in plenty (even above ground in two places) for fuel, when the woods shall be destroyed. This colony would have the trade of the Miamis or Twigtwees ; and should, at first, have a small fort near Hochockin, at the head of the river, and another near the mouth of Wabash. Sandusky, a French fort near the Lake Erie, should also be taken ; and all the little French forts south and west of the Lakes, quite to the Mississippi, be removed, or taken and garrisoned by the English. The colonists for this settlement might assemble near the heads of the rivers in Virginia, and march over land to the navigable branches of the Kenhawa, where they might embark with all their baggage and provisions, and fall into the Ohio, not far above the mouth of the Scioto. Or they might rendezvous at Will's Creek, and go down the Monongahela to the Ohio.

The fort and armed vessels at the strait of Niagara would be a vast security to the frontiers of these new colonies against any attempts of the French from Canada. The fort at the mouth of the Wabash would guard that river, the Ohio, and the Cutava

River, in case of any attempt from the French of the Mississippi. Every fort should have a small settlement round it, as the fort would protect the settlers, and the settlers defend the fort and supply it with provisions.

The difficulty of settling the first English colonies in America, at so great a distance from England, must have been vastly greater than the settling these proposed new colonies ; for it would be the interest and advantage of all the present colonies to support these new ones ; as they would cover their frontiers, and prevent the growth of the French power behind or near their present settlements ; and the new country is nearly at equal distance from all the old colonies, and could easily be assisted from all of them.

And as there are already in all the old colonies many thousands of families that are ready to swarm, wanting more land, the richness and natural advantage of the Ohio country would draw most of them thither, were there but a tolerable prospect of a safe settlement. So that the new colonies would soon be full of people ; and, from the advantage of their situation, become much more terrible to the French settlements than those are now to us. The gaining of the back Indian trade from the French, by the navigation of the Lakes, &c., would of itself greatly weaken our enemies, it being now their principal support. It seems highly probable, that in time they must be subjected to the British crown, or driven out of the country.

Such settlements may better be made now, than

fifty years hence ; because it is easier to settle ourselves, and thereby prevent the French settling there, as they seem now to intend, than to remove them when strongly settled.

If these settlements are postponed, then more forts and stronger, and more numerous and expensive garrisons, must be established, to secure the country, prevent their settling, and secure our present frontiers ; the charge of which may probably exceed the charge of the proposed settlements, and the advantage nothing near so great.

The fort at Oswego should likewise be strengthened, and some armed half-galleys, or other small vessels, kept there to cruise on Lake Ontario, as proposed by Mr. Pownall in his paper laid before the commissioners at the Albany treaty.

If a fort was also built at Tirondequat on Lake Ontario, and a settlement made there near the lake side, where the lands are said to be good, much better than at Oswego, the people of such settlements would help to defend both forts on any emergency.

CXLIX.

TO ROBERT CHARLES. ¹

PHILADELPHIA, 1 February, 1757.

SIR :—By this ship you will receive a box containing sundry copies of our last years' Votes, to which are added, as you advised, the accounts of the expenditure of the fifty-five thousand pounds, and the

¹ Many years agent in England for the Assembly of Pennsylvania.

subsequent thirty thousand. Also the papers relating to the employing of foreign officers. There is likewise in the box an authenticated copy of our late bill for granting one hundred thousand to the King's use, and of the vote appointing yourself and Mr. Partridge agents, under the great seal, with all the late messages. You will see in the Votes a copy of the Proprietary Instructions, in which a money bill is made for us by the Proprietary, sitting in his closet at one thousand leagues' distance.

The governor laid before us an estimate of the necessary expense for defraying the province one year, amounting to one hundred and five thousand pounds. We knew our inability to bear the raising of so great a sum in so short a time. We deducted the least necessary articles, and reduced it to one hundred thousand pounds, which we granted, and sent up the bill. Not that we thought this province capable of paying such a tax yearly, or any thing near it, but believing it necessary to exert ourselves at this time in an extraordinary manner, to save the country from total ruin by the enemy. The governor, to use his own polite word, *REJECTS* it. Your English kings, I think, are complaisant enough to say *they will advise upon it*. We have no remedy here, but must obey the instruction, by which we are so confined, as to the time of rating the property to be taxed, the valuation of that property, and the sum per pound to be taxed on the valuation, that it is demonstrably impossible by such a law to raise one quarter of the money absolutely necessary to defend

us. Three fourths of the troops must be disbanded, and so the country be exposed to the mercy of our enemies, rather than the least tittle of a Proprietary instruction should be deviated from !

I forbear to enlarge, because the House have unanimously desired your friend Mr. Norris, and myself, to go home immediately, to assist their agents in getting these matters settled. He has not yet determined ; but if he goes, you will by him be fully informed of every thing, and my going will not, in my opinion, be necessary. If he declines it, I may possibly soon have the pleasure of seeing you. I am with great respect, Sir, &c.,

B. FRANKLIN.

CL.

REPORT

OF THE COMMITTEE OF AGGRIEVANCES OF THE ASSEMBLY OF PENNSYLVANIA.

DATED FEBRUARY 22D, 1757.¹

In obedience to the order of the House, we have drawn up the heads of the most important aggriev-

¹ The English colonial governments were of three sorts. First, *Provincial* governments ; where the constitution originally depends on the King's commission and instructions, given to his governors ; and the Assemblies, held under that authority, have their share in making local ordinances not repugnant to English law. Next, *Proprietary* governments ; where a district of country is given by the crown to individuals, attended with certain legislative powers in the nature of a fief ; with a provision for the sovereignty at home, and also for the fulfilment of the terms and end of the grant. Last-

ly, *Charter* governments, where the fundamentals of the government are previously prescribed and made known to the settlers, being in no degree left subject to a governor's commission or proprietor's will. (See *Blackstone*, Vol. I. *Introductio*. § 4.) Good faith, however, to mankind, seemed to require that the constitutions, once begun under the provincial or proprietary governments, should remain unaltered (except for improvement) to the respective settlers ; equally as in charter governments.

By the last paragraph of the following Report, it seems that the Assem-

ances that occur to us, which the people of this province with great difficulty labor under; the many infractions of the constitution (in manifest violation of the royal grant, the proprietary charter, the laws of this province, and of the laws, usages, and customs of our mother country), and other matters, which we apprehend call aloud for redress.

They are as follow :

First. By the royal charter (which has ever been, ought to be, and truly is, the principal and invariable fundamental of this constitution), King Charles the Second did give and grant unto William Penn, his heirs and assigns, the province of Pennsylvania; and also to him and his heirs, and his or their *deputies* or lieutenants, free, full, and absolute power for the good and happy government thereof, to make and enact any laws, "according to their best discretion, by and with the advice, assent, and approbation of the *freemen* of the said country, or of their delegates or deputies"; for the raising of money, or any other end appertaining to the public state, peace, or safety of the said country. By the words of this grant, it is evident that full powers are granted to the *deputies* and lieutenants of William Penn and his heirs, to concur with the people in framing laws for their protection and the safety of the province, according to their best discretion; independent of any instructions or directions

bly established in Pennsylvania intended to send commissioners to England to solicit redress of various grievances, particularly respecting their Proprietors' conduct; and that, the business being referred to a com-

mittee of the Assembly, the following Report was meant to convey the opinion of that committee concerning the instructions necessary to be given by the Assembly to the commissioners.—
B. V.

they should receive from their *principals*. And it is equally obvious to your committee, that the *people* of this province and their representatives were interested in this royal grant ; and by virtue thereof have an original right of legislation inherent in them, which neither the proprietors nor any other person whatsoever can divest them of, restrain or abridge, without manifestly violating and destroying the letter, spirit, and design of this grant.

Nevertheless we unfortunately find, that the proprietaries of this province, regardless of this sacred fundamental of all our rights and liberties, have so abridged and restricted their late and present *governor's* discretion in matters of legislation, by their illegal, impracticable, and unconstitutional instructions and prohibitions, that no bill for granting aids and supplies to our most gracious Sovereign (be it ever so reasonable, expedient, and necessary for the defence of his Majesty's colony, and safety of his people), unless it be agreeable thereto, can meet with its approbation ; by means whereof the many considerable sums of money, which have been offered for those purposes by the Assemblies of this province (ever anxious to maintain his honor and rights), have been rejected ; to the great encouragement of his Majesty's enemies, and the imminent danger of the loss of this his colony.

Secondly. The representatives of the people in General Assembly met, by virtue of the said royal grant, and the charter and privileges granted by the said William Penn, and a law of this province, have right to, and ought to enjoy, all the powers and privileges

of an Assembly, according to the rights of the free-born subjects of England, and as is usual in any of the plantations of America. It is an indubitable and now an uncontested right of the Commons of England to *grant aids* and supplies to his Majesty in any manner they think most easy to themselves and the people ; and they are the sole judges of the *measure, manner, and time* of granting and raising the same.

Nevertheless the proprietaries of this province, in contempt of the said royal grant, proprietary charter, and law of their colony ; designing to subvert the fundamentals of this constitution, to deprive the Assembly and people of their rights and privileges, and to assume an arbitrary and tyrannical power over the liberties and properties of his Majesty's liege subjects ; have so restrained their governors by the *despotic instructions* (which are not to be varied from, and are particularly directory in the framing and passing of money bills and supplies to his Majesty, as to the mode, measure, and time), that it is impossible for the Assembly, should they lose all sense of their most essential rights, and comply with those instructions, to grant sufficient aids for the defence of this his Majesty's province from the common enemy.

Thirdly. In pursuance of sundry acts of General Assembly, approved of by the crown, and a natural right inherent in every man antecedent to all laws, the Assemblies of this province have had the power of *disposing* of the *public* moneys, that have been raised for the encouragement of trade and support of government by the interest money arising by the

loans of the bills of credit and the excise. No part of these moneys was ever paid by the *proprietaries*, or ever raised on their estates ; and therefore they can have no pretence of right to a voice in the disposition of them. They have even been applied with prudent frugality to the honor and advantage of the public and the King's immediate service, to the general approbation of the people ; the credit of the government has been preserved, and the debts of the public punctually discharged. In short, no inconveniences, but great and many advantages, have accrued from the Assembly's prudent care and management of these funds.

Yet the proprietaries resolved to deprive the Assemblies of the power and means of *supporting an agent* in England, and of prosecuting their complaints and remonstrating their aggrievances, when injured and oppressed, to his Majesty and his Parliament ; and, to rob them of this natural right (which has been so often approved of by their gracious Sovereign), have, by their said instructions, prohibited their governor from giving his assent to any laws emitting or reëmitting any paper currency or bills of credit, or for raising money by excise or any other method ; unless the governor or commander-in-chief for the time being, by clauses to be inserted therein, have a *negative in the disposition* of the moneys arising thereby ; let the languishing circumstances of our trade be ever so great, and a further or greater medium be ever so necessary for its support.

Fourthly. By the laws and statutes of England,

the chief rents, honors, and castles of the *crown* are taxed, and *pay their proportion* to the supplies that are granted to the King for the defence of the realm and support of government. His Majesty, the nobility of the realm, and all the British subjects do now actually contribute their proportion towards the defence of America in general, and this province in particular; and it is in a more especial manner the duty of the *proprietaries* to pay their proportion of a tax for the immediate preservation of their own estates in this province. To exempt, therefore, any part of their estates from their reasonable part of this necessary burthen, is as unjust as it is illegal, and as new as it is arbitrary.

Yet the proprietaries, notwithstanding the general danger to which the nation and its colonies are exposed, and great distress of this province in particular, by their said instructions have prohibited their governors from passing laws for the raising supplies for its defence; *unless* all their located, unimproved, and unoccupied lands, quit-rents, fines, and purchase moneys on interest (the much greater part of their enormous estates in this colony) are expressly exempted from paying any part of the tax.

Fifthly. By virtue of the said royal charter, the proprietaries are invested with a power of doing all things, "which unto a complete establishment of justice, unto courts and tribunals, forms of judicature, and manner of proceedings, do belong." It was certainly the import and design of this grant, that the courts of judicature should be formed, and the *judges*

and officers thereof hold their commissions, in a manner not repugnant, but agreeable, to the laws and customs of England ; that thereby they might remain free from the influence of persons in power, the rights of the people might be preserved, and their properties effectually secured. That the grantee, William Penn (understanding the said grant in this light), did, by his original frame of government, covenant and grant with the people, that the judges and other officers should hold their commissions during their *good behaviour, and no longer*.

Notwithstanding which, the governors of this province have, for many years past, granted all the commissions to the judges of the King's Bench or supreme court of this province, and to the judges of the court of Common Pleas of the several counties, to be held during their *will and pleasure* ; by means whereof the said judges being subject to the influence and direction of the proprietaries and their governors, their favorites and creatures, the laws may not be duly administered or executed, but often wrested from their true sense to serve particular purposes ; the foundation of justice may be liable to be destroyed ; and the lives, laws, liberties, privileges, and properties of the people thereby rendered precarious and altogether insecure ; to the great disgrace of our laws, and the inconceivable injury of his Majesty's subjects.

Your committee further beg leave to add, that, besides these aggrievances, there are other hardships the people of this province have experienced, that

call for redress. The *enlistment of servants without the least satisfaction* being made to the masters, has not only prevented the cultivation of our lands, and diminished the trade and commerce of the province, but is a burthen extremely unequal and oppressive to individuals. And should the practice continue, the consequence must prove very discouraging to the further settlement of this colony, and prejudicial to his Majesty's future service. Justice, therefore, demands that satisfaction should be made to the masters of such enlisted servants, and that the right of masters to their servants be confirmed and settled. But as those servants have been enlisted into his Majesty's service for the general defence of America, and not of this province only, but all the colonies, and the nation in general, have and will receive equal benefit from their service, this satisfaction should be made at the expense of the nation, and not of the province only.

That the people now labor under *a burthen of taxes* almost insupportable by so young a colony, for the defence of its long-extended frontier, of about two hundred miles from New Jersey to Maryland ; without either of those colonies, or the three lower counties on Delaware, contributing their proportion thereto ; though their frontiers are in a great measure covered and protected by our forts. And should the war continue, and with it this unequal burthen, many of his Majesty's subjects in this province will be reduced to want ; and the province, if not lost to the enemy, involved in debt and sunk under its load.

That, notwithstanding this weight of taxes, the Assemblies of this province *have given to the general service* of the nation five thousand pounds to purchase provisions for the troops under General Braddock ; £2,985. os. 11*d.* for clearing a road by his orders ; £10,514. 10s. 1*d.* to General Shirley, for the purchasing provisions for the New England forces ; and expended the sum of £2,385. os. 2½*d.* in supporting the inhabitants of Nova Scotia ; which likewise we conceive ought to be a national expense.

And that his Majesty's subjects, the merchants and insurers in England, as well as the merchants here and elsewhere, did during the last and will during the present war greatly suffer in their property, trade, and commerce, by the *enemy's privateers* on this coast, and at our capes, unless some method be fallen on to prevent it.

Wherefore your committee are of opinion, that the commissioners, intended to be sent to England to solicit a memorial and redress of the many infractions and violations of the constitution, should also have it in charge, and be instructed, to represent to our most gracious Sovereign and his Parliaments the several unequal burthens and hardships before mentioned ; and endeavour to procure satisfaction to the masters of such servants as have been enlisted, and the right of masters to their servants established and confirmed ; and obtain a repayment of the said several sums of money, some assistance towards defending our extensive frontier, and a vessel of war to protect the trade and commerce of this province.

Submitted to the correction of the House.

CLI.

TO MRS. JANE MECOM.

PHILADELPHIA, 21 February, 1757.

DEAR SISTER :—I am glad to hear your son has got well home. I like your conclusion not to take a house for him till summer, and if he stays till his new letters arrive, perhaps it would not be amiss ; for a good deal depends on the first impression a man makes. As he will keep a bookseller's shop with his printing-house, I don't know but it might be worth his while to set up at Cambridge.

I enclose you some whisk seed ; it is a kind of corn, good for creatures ; it must be planted in hills, like Indian corn. The tops make the best thatch in the world ; and of the same are made the whisks you use for velvet. Pray try if it will grow with you. I brought it from Virginia. Give some to Mr. Cooper, some to Mr. Bowdoin. Love to cousin Sally, and her spouse. I wish them and you much joy. Love to brother, &c.,

B. FRANKLIN.

CLII.

TO WILLIAM PARSONS.

PHILADELPHIA, 22 February, 1757.

DEAR FRIEND :—I thank you for the intelligence from Fort Allen relating to the Indians. The commissioners have not yet settled your account, but I will press them to do it immediately. I have not heard from Mr. Stephenson, but will write to him once more.

And now, my dear old friend, I am to take leave of you, being ordered home to England by the Assembly, to obtain some final settlement of the points that have occasioned so many unhappy disputes. I assure you I go with the sincerest desire of procuring peace, and therein I know I shall have your prayers for my success. God bless you, and grant that at my return I may find you well and happy. I am, as ever, dear friend, yours affectionately,

B. FRANKLIN.¹

CLIII.

TO MISS CATHERINE RAY.

PHILADELPHIA, 3 March, 1757.

DEAR KATY :—Being about to leave America for some time, I could not go without taking leave of my dear friend. I received your favor of the 8th of November, and am ashamed, that I have suffered it to remain so long unanswered, especially as now, through

¹ On the 29th of January, the Assembly resolved that Isaac Norris, the Speaker of the House, and Benjamin Franklin, should be requested to go to England, "as commissioners to solicit the removal of grievances occasioned by proprietary instructions, &c." When they were called upon to declare to the Assembly, whether they would comply with the request, Mr. Norris declined, and gave as a reason the state of his health. Mr. Franklin said "that he esteemed the nomination by the House to that service as a high honor, but that he thought, if the Speaker could be prevailed on to undertake it, his long experience in public affairs would render the addition of another unnecessary; that he held

himself, however, in the disposition of the House, and was ready to go whenever they should think fit to require his service." It was then resolved, "that Benjamin Franklin be, and he is hereby, appointed Agent of this province, to solicit and transact the affairs thereof in Great Britain." See "Votes and Proceedings," February 3d. His son was at this time clerk of the House, and it was resolved "that William Franklin have leave to resign his office of clerk of this House, that he may accompany his father, appointed one of the commissioners to negotiate our affairs in England, and that another person be chosen to serve as clerk during the absence of the said Franklin."—*February 18th.*

shortness of time, I cannot chat with you in any manner agreeably.

I can only wish you well and happy, which I do most cordially. Present my best compliments to your good mamma, brother and sister Ward, and all your other sisters, the agreeable Misses Ward, Dr. Babcock and family, the charitable Misses Stanton, and, in short, to all that love me. I should have said all that love you, but that would be giving you too much trouble. Adieu, dear good girl, and believe me ever your affectionate friend,

B. FRANKLIN.

CLIV.

TO MR. DUNLAP.

PHILADELPHIA, 4 April, 1757.

I now appoint you postmaster of Philadelphia, during our absence, as it will be some present employment for you till our return ; when I hope to put you in a better way, if I find you diligent, careful, and faithful.

I would not have the office remov'd on any account from my house during my absence, without my leave first obtain'd.

And as Mrs. Franklin has had a great deal of experience in the management of the post-office, I depend on your paying considerable attention to her advice in that matter.

As I leave but little money with Mrs. Franklin for the support of the family, and have (torn —) of the post-office for the (torn — —) absence, I expect and (torn — —) account with her for, and

pay her, every Monday morning, the postage of the preceding week, taking her receipts for the same, and retaining only your commissions of ten per cent. You should have a little book for such receipts.

Wishing you health and happiness, I am, your affectionate uncle,

B. FRANKLIN.

CLV.

TO MRS. DEBORAH FRANKLIN.

TRENTON,¹ 5 April, 1757.

MY DEAR CHILD :—We found the roads much better than we expected, and got here well before night. My kind friend Mr. Griffith's carriage appearing too weak in the wheels, I have accepted Mr. Masters's obliging offer, and take his carriage forward from this place, and he will return to town in Mr. Griffith's. About a dozen of our friends accompanied us quite hither, to see us out of the province, and we spent a very agreeable evening together. I leave home, and undertake this long voyage, the more cheerfully, as I can rely on your prudence in the management of my affairs and education of our dear child ; and yet I cannot forbear once more recommending her to you with a father's tenderest concern. My love to all. If the roads do not prove worse, we may be at Woodbridge to-night. I believe I did not see Mr. Dunlap when I came away, so as to take leave of him ; my love to him. Billy presents his duty and love to all. I am your affectionate husband,

B. FRANKLIN.

¹ On his way to New York, where he was to take passage for England.

CLVI.

TO JOHN LINING, AT CHARLESTON, SOUTH CAROLINA.

NEW YORK, 14 April, 1757.

SIR :—It is a long time since I had the pleasure of a line from you ; and, indeed, the troubles of our country, with the hurry of business I have been engaged in on that account, have made me so bad a correspondent, that I ought not to expect punctuality in others.

But being about to embark for England, I could not quit the continent without paying my respects to you, and, at the same time, taking leave to introduce to your acquaintance a gentleman of learning and merit, Colonel Henry Bouquet, who does me the favor to present you this letter, and with whom I am sure you will be much pleased.

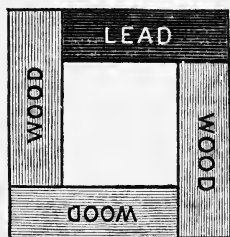
Professor Simson, of Glasgow, lately communicated to me some curious experiments of a physician of his acquaintance, by which it appeared that an extraordinary degree of cold, even to freezing, might be produced by evaporation. I have not had leisure to repeat and examine more than the first and easiest of them, viz. : Wet the ball of a thermometer by a feather dipped in spirit of wine, which has been kept in the same room, and has, of course, the same degree of heat or cold. The mercury sinks presently three or four degrees, and the quicker if during the evaporation you blow on the ball with the bellows ; a second wetting and blowing, when the mercury is down, carries it yet lower. I think I did not get it lower

than five or six degrees from where it naturally stood, which was, at that time, sixty. But it is said, that a vessel of water being placed in another somewhat larger, containing spirit, in such a manner that the vessel of water is surrounded with the spirit, and both placed under the receiver of an air-pump, on exhausting the air, the spirit evaporating, leaves such a degree of cold as to freeze the water, though the thermometer, in the open air, stands many degrees above the freezing point.

I know not how this phenomenon is to be accounted for ; but it gives me occasion to mention some loose notions relating to heat and cold, which I have for some time entertained, but not yet reduced into any form. Allowing common fire, as well as electrical, to be a fluid capable of permeating other bodies, and seeking an equilibrium, I imagine some bodies are better fitted by nature to be conductors of that fluid than others ; and that, generally, those which are the best conductors of electrical fluid, are also the best conductors of this ; and *e contra*.

Thus a body which is a good conductor of fire readily receives it into its substance, and conducts it through the whole to all the parts, as metals and water do ; and if two bodies, both good conductors, one heated, the other in its common state, are brought into contact with each other, the body which has most fire readily communicates of it to that which had least, and that which had least readily receives it, till an equilibrium is produced. Thus, if you take a dollar between your fingers with one hand, and a

piece of wood, of the same dimensions, with the other, and bring both at the same time to the flame of a candle, you will find yourselves obliged to drop the dollar before you drop the wood, because it conducts the heat of the candle sooner to your flesh. Thus, if a silver tea-pot had a handle of the same metal, it would conduct the heat from the water to the hand, and become too hot to be used ; we therefore give to a metal tea-pot a handle of wood, which is not so good a conductor as metal. But a china or stone tea-pot being in some degree of the nature of glass, which is not a good conductor of heat, may have a handle of the same stuff. Thus, also, a damp moist air shall make a man more sensible of cold, or chill him more, than a dry air that is colder, because a moist air is fitter to receive and conduct away the heat of his body. This fluid, entering bodies in great quantity, first expands them by separating their parts a little ; afterwards, by farther separating their parts, it renders solids fluid, and at length dissipates their parts in air. Take this fluid from melted lead, or from water, the parts cohere again ; and this is sooner done by the means of good conductors.



Thus, if you take, as I have done, a square bar of lead, four inches long, and one inch thick, together with three pieces of wood planed to the same dimensions, and lay them, as in the margin, on a smooth board, fixed so as not to be easily separated or moved, and pour into the cavity they form

as much melted lead as will fill it, you will see the melted lead chill, and become firm, on the side next the leaden bar, some time before it chills on the other three sides in contact with the wooden bars, though, before the lead was poured in, they might all be supposed to have the same degree of heat or coldness, as they had been exposed in the same room to the same air. You will likewise observe that the leaden bar, as it had cooled the melted lead more than the wooden bars have done, so it is itself more heated by the melted lead. There is a certain quantity of this fluid, called fire, in every human body, which fluid, being in due proportion, keeps the parts of the flesh and blood at such a just distance from each other, as that the flesh and nerves are supple and the blood fit for circulation. If part of this due proportion of fire be conducted away, by means of a contact with other bodies, as air, water, or metals, the parts of our skin and flesh that come into such contact first draw more together than is agreeable, and give that sensation which we call cold ; and if too much be conveyed away, the body stiffens, the blood ceases to flow, and death ensues. On the other hand, if too much of this fluid be communicated to the flesh, the parts are separated too far, and pain ensues, as when they are separated by a pin or lancet. The sensation that the separation by fire occasions, we call heat, or burning. My desk on which I now write and the lock of my desk are both exposed to the same temperature of the air, and have therefore the same degree of heat or cold ; yet if I lay my

hand successively on the wood and on the metal, the latter feels much the coldest, not that it is really so, but being a better conductor, it more readily than the wood takes away and draws into itself the fire that was in my skin. Accordingly, if I lay one hand, part on the lock and part on the wood, and after it has lain so some time, I feel both parts with my other hand, I find the part that has been in contact with the lock very sensibly colder to the touch than the part that lay on the wood. How a living animal obtains its quantity of this fluid, called fire, is a curious question. I have shown that some bodies (as metals) have a power of attracting it stronger than others; and I have sometimes suspected that a living body had some power of attracting out of the air, or other bodies, the heat it wanted. Thus metals hammered or repeatedly bent grow hot in the bent or hammered part. But when I consider that air in contact with the body cools it; that the surrounding air is rather heated by its contact with the body; that every breath of cooler air drawn in carries off part of the body's heat when it passes out again; that therefore there must be in the body a fund for producing it, or otherwise the body would soon grow cold: I have been rather inclined to think that the fluid *fire*, as well as the fluid *air*, is attracted by plants in their growth, and becomes consolidated with the other materials of which they are formed, and makes a great part of their substance; that, when they come to be digested, and to suffer in the vessels a kind of fermentation, part

of the fire, as well as part of the air, recovers its fluid, active state again, and diffuses itself in the body, digesting and separating it ; that the fire so reproduced by digestion and separation, continually leaving the body, its place is supplied by fresh quantities, arising from the continual separation ; that whatever quickens the motion of the fluids in an animal quickens the separation, and reproduces more of the fire, as exercise ; that all the fire emitted by wood and other combustibles when burning existed in them before in a solid state, being only discovered when separating ; that some fossils, as sulphur, sea-coal, &c., contain a great deal of solid fire ; and that, in short, what escapes and is dissipated in the burning of bodies, besides water and earth, is generally the air and fire that before made parts of the solid. Thus I imagine that animal heat arises by or from a kind of fermentation in the juices of the body, in the same manner as heat arises in the liquors preparing for distillation, wherein there is a separation of the spirituous from the watery and earthy parts. And it is remarkable that the liquor in a distiller's vat, when in its highest and best state of fermentation, as I have been informed, has the same degree of heat with the human body—that is, about 94 or 96.

Thus, as by a constant supply of fuel in a chimney you keep a warm room, so by a constant supply of food in the stomach, you keep a warm body ; only, where little exercise is used, the heat may possibly be conducted away too fast, in which case such materials are to be used for clothing and bedding,

against the effects of an immediate contact of the air, as are in themselves bad conductors of heat, and consequently prevent its being communicated through their substance to the air. Hence what is called *warmth* in wool, and its preference on that account to linen, wool not being so good a conductor ; and hence all the natural coverings of animals to keep them warm are such as retain and confine the natural heat in the body, by being bad conductors, such as wool, hair, feathers, and the silk by which the silk-worm in its tender embryo state is first clothed. Clothing thus considered does not make a man warm by *giving* warmth, but by *preventing* the too quick dissipation of the heat produced in his body, and so occasioning an accumulation.

There is another curious question I will just venture to touch upon, viz.: Whence arises the sudden extraordinary degree of cold, perceptible on mixing some chemical liquors, and even on mixing salt and snow, where the composition appears colder than the coldest of the ingredients? I have never seen the chemical mixtures made; but salt and snow I have often mixed myself, and am fully satisfied that the composition feels much colder to the touch, and lowers the mercury in the thermometer more, than either ingredient would do separately. I suppose, with others, that cold is nothing more than the absence of heat or fire. Now, if the quantity of fire before contained or diffused in the snow and salt was expelled in the uniting of the two matters, it must be driven away either through the air or the vessel containing them. If it is driven off through the air, it must warm the

air ; and a thermometer held over the mixture, without touching it, would discover the heat by the rising of the mercury, as it must, and always does, in warm air.

This, indeed, I have not tried, but I should guess it would rather be driven off through the vessel, especially if the vessel be metal, as being a better conductor than air ; and so one should find the basin warmer after such mixture. But, on the contrary, the vessel grows cold, and even water, in which the vessel is sometimes placed for the experiment, freezes into hard ice on the basin. Now I know not how to account for this, otherwise than by supposing that the composition is a better conductor of fire than the ingredients separately, and, like the lock compared with the wood, has a stronger power of attracting fire, and does accordingly attract it suddenly from the fingers, or a thermometer put into it, from the basin that contains it, and from the water in contact with the outside of the basin ; so that the fingers have the sensation of extreme cold, by being deprived of much of their natural fire ; the thermometer sinks, by having part of its fire drawn out of the mercury ; the basin grows colder to the touch, as, by having its fire drawn into the mixture, it is become more capable of drawing and receiving it from the hand ; and, through the basin, the water loses its fire that kept it fluid, so it becomes ice. One would expect, that from all this attracted acquisition of fire to the composition, it should become warmer ; and, in fact, the snow and salt dissolve at the same time into water, without freezing.

I am, Sir, &c.,

B. FRANKLIN.

CLVII.

TO MRS. JANE MECOM.

NEW YORK, 19 April, 1757.

DEAR SISTER :—I wrote a few lines to you yesterday, but omitted to answer yours relating to sister Dowse. As *having their own way* is one of the greatest comforts of life to old people, I think their friends should endeavour to accommodate them in that, as well as in any thing else. When they have long lived in a house, it becomes natural to them ; they are almost as closely connected with it as the tortoise with his shell ; they die, if you tear them out of it ; old folks and old trees, if you remove them, it is ten to one that you kill them ; so let our good old sister be no more importuned on that head. We are growing old fast ourselves, and shall expect the same kind of indulgences ; if we give them, we shall have a right to receive them in our turn.

And as to her few fine things, I think she is in the right not to sell them, and for the reason she gives, that they will fetch but little ; when that little is spent, they would be of no further use to her ; but perhaps the expectation of possessing them at her death may make that person tender and careful of her, and helpful to her to the amount of ten times their value. If so, they are put to the best use they possibly can be.

I hope you visit sister as often as your affairs will permit, and afford her what assistance and comfort you can in her present situation. *Old age, infirmities, and poverty*, joined, are afflictions enough. The *neg-*

lect and *slights* of friends and near relations should never be added. People in her circumstances are apt to suspect this sometimes without cause; *appearances* should therefore be attended to, in our conduct towards them, as well as *realities*. I write by this post to cousin Williams, to continue his care, which I doubt not he will do.

We expect to sail in about a week, so that I can hardly hear from you again on this side the water; but let me have a line from you now and then, while I am in London. I expect to stay there at least a twelvemonth. Direct your letters to be left for me at the Pennsylvania Coffee-house, in Birchin Lane, London. My love to all, from, dear sister, your affectionate brother,

B. FRANKLIN.

P. S.—April 25th. We are still here, and perhaps may be here a week longer. Once more adieu, my dear sister.

CLVIII.

TO MRS. JANE MECOM.

WOODBIDGE, NEW JERSEY, 21 May, 1757.

DEAR SISTER :—I received your kind letter of the 9th instant, in which you acquainted me with some of your late troubles. These are troublesome times to us all; but perhaps you have had more than you should. I am glad to hear that Peter is at a place where he has full employ. A trade is a valuable thing; but unless a habit of industry be acquired with it, it turns out of little use; if he gets *that* in

his new place, it will be a happy exchange, and the occasion not an unfortunate one. It is very agreeable to me to hear so good an account of your other children ; in such a number to have no bad ones is a great happiness.

The horse sold very low indeed. If I wanted one to-morrow, knowing his goodness, old as he is, I should freely give more than twice the money for him ; but you did the best you could, and I will take of Benny no more than he produced.

I don't doubt but Benny will do very well when he gets to work ; but I fear his things from England may be so long a coming as to occasion the loss of the rent. Would it not be better for you to move into the house ? Perhaps not, if he is near being married. I know nothing of that affair but what you write me, except that I think Miss Betsey a very agreeable, sweet-tempered, good girl, who has had a housewifely education, and will make, to a good husband, a very good wife. Your sister and I have a great esteem for her ; and if she will be kind enough to accept of our nephew, we think it will be his own fault if he is not as happy as the married state can make him. The family is a respectable one, but whether there be any fortune I know not ; and as you do not inquire about this particular, I suppose you think with me, that where every thing else desirable is to be met with, that is not very material. If she does not *bring* a fortune, she will help to *make* one. Industry, frugality, and prudent economy in a wife, are to a tradesman, in their effects, a fortune ;

and a fortune sufficient for Benjamin, if his expectations are reasonable. We can only add that if the young lady and her friends are willing, we give our consent heartily, and our blessing. My love to brother and the children. Your affectionate brother,

B. FRANKLIN.

P. S.—If Benny will promise to be one of the tenderest husbands in the world, I give my consent. He knows already what I think of Miss Betsey. I am his loving aunt,

DEBORAH FRANKLIN.

CLIX.

TO MRS. DEBORAH FRANKLIN.

NEW YORK, Friday, 27 May, 1757.

MY DEAR DEBBY :—Mr. Parker being doubtful this morning whether the rain would permit his setting out to-day, I had prepared no letter to send by Sally, when he took a sudden resolution to go. Mr. Colden¹ could not spare his daughter, as she helps him in the post-office, he having no clerk. I enclose only the fourth bills, which you are to put up safe with my writings. The first set I take with me, the second goes by Radford, and I now send the third by Bonnel.

All the packets are to sail together with the fleet, but when that will be is yet uncertain ; for yesterday came in three privateers with several prizes, and by them there is advice that the French fleet, which was in the West Indies, is come to the northward ; and

¹ Mr. Alexander Colden, the postmaster in New York.

now it is questioned whether it will be thought prudent for these transports to sail till there is certain advice that the grand fleet is arrived from England. This, however, is only town talk.

I send Mr. Kneeland's letter. Pray forward the paper he writes for, by the first opportunity. I send a memorandum received from Joseph Croker, with a note on the back of it. I leave it to yourself whether to go home directly, or stay a little longer. If I find we are not likely to sail for some time, I shall perhaps step down again to Woodbridge and try to finish my work. But it may be that your longer absence from home will be attended with some inconvenience. I am making up a bundle of papers to send you. Put them into my room. I can hear nothing yet of the clothes.

I have been very low-spirited all day. This tedious state of uncertainty and long waiting have almost worn out my patience. Except the two or three weeks at Woodbridge, I know not when I have spent time so uselessly as since I left Philadelphia.

I left my best spectacles on the table. Please to send them to me.

Saturday Morning.—Jemmy got here early, and tells me Mr. Parker and the children got well down. In my room on the folio shelf between the clock and our bedchamber, stands a folio, called the *Gardiner's Dictionary*, by P. Miller. And on the same side of the room, on the lowest shelf or lowest but one, near the middle, and by the side of a little partition, you will find standing or rather lying on its fore edge a

quarto pamphlet, covered with blue paper, called a *Treatise on Cider-making*. Deliver those two books to Mr. Parker.

Sunday Afternoon.—Yesterday, while I was at my Lord's,¹ with whom I had the honor to dine, word was brought in that five sail of French men-of-war were seen off Egg Harbour the day before ; and as some of the French prisoners lately brought in report that such a number of men-of-war sailed with them from the West Indies to go to the northward, these vessels might be supposed to be the same, if the account from Egg Harbour was true. If on examination it be found true, and the French take it into their heads to cruise off this port with such a force, we shall then be shut up here for some time, for our fleet here is not of force sufficient to venture out. If this story be not true, yet it is thought by some we shall hardly sail till there is certain advice of the English fleet being arrived at Halifax, and perhaps not till a convoy comes from thence to guard us. So I am wavering whether I had not best go down again to Woodbridge and finish my books.

I spent last evening with Mr. Nichol's family, who all desired their compliments to you and Sally. I send you one of the French books translated.

Monday Morning.—Our going is yet uncertain. I believe I shall put every thing on board to-morrow, and either go down again to Woodbridge or send for the trunk of books hither to employ myself till we

¹ Lord Loudoun, who had lately arrived as commander-in-chief in America, being successor to General Shirley.

have sailed. The report of French men-of-war off the coast is vanished. I am, my dear Debby, your ever loving husband,

B. FRANKLIN.

CLX.

TO ISAAC NORRIS.¹

NEW YORK, 30 May, 1757.

SIR:—After waiting here about seven weeks for the sailing of the packet, the time of her sailing is no more certain now than it was on the day of our arrival. The packets, as it is now said, are all three to sail with the fleet; the two first to be dismissed soon after the fleet is at sea; the third to go with the fleet to the place of rendezvous, and not to be discharged till the arrival and junction of the fleet from England. But this is not certain; resolutions change as advices are received, or occurrences arise, and it is doubtful whether the fleet will sail from hence till there is certain news of the arrival of that from England, since there is intelligence that Beaufremont's squadron is gone from the West Indies to the northward.

I have had the honor of several conferences with my Lord Loudoun on the subject of the servants.²

¹ For many years Speaker of the Assembly of Pennsylvania.

² It was common for emigrants, of the poorer class, to pay for their passage by selling their time for a certain number of years to the captain in whose ship they came over. The time, or term of service, thus pledged, was sold by the captain, after his arrival in port, to farmers in the country. During the war it had been a practice of the recruiting officers to enlist these

servants into the army, thus depriving the farmers of their services, and of the value that had been paid for them. Redress was sought from the government, and Franklin was instructed to lay the subject before Lord Loudoun, the commander-in-chief of the army. Other particulars respecting emigrant servants, and the enlistment of them, may be seen in Sparks' edition of "Washington's Writings," vol. ii., pp. 168, 189, 199.

His Lordship objects, first, that it appears by the list which I laid before him, that many of the servants were enlisted in General Braddock's and General Shirley's time. With those he has nothing to do. Secondly, that many were enlisted before the act of Parliament appointed satisfaction to be made to the masters ; and as the lawyers all agree that the right to take them without pay was clearly in the King before the act, no satisfaction should be made or expected for these. Thirdly, that the particular proofs of the loss of each servant, and of his being enlisted in the King's service, do not appear. Fourthly, that the affair is now so intricate and perplexed, that it would take more time to examine and settle it than he can possibly spare. Fifthly, that if his officers had done wrong in not paying for the servants, as they took them, the fault was our own ; it was owing to some principal people among ourselves, whom he could name, who had always assured the officers that the Assembly intended to pay for the servants, and by that means led them into the error.

His Lordship made several other observations and objections, all which I answered and endeavoured to remove as well as I could ; but there is, I believe, one at bottom, which it is not in my power to remove, and that is the want of money. The expenses of an American war necessarily run very high, and are complained of by some in England ; and his Lordship is unwilling to discourage the ministry at home by large charges. He will therefore mix none of

those of his predecessors with his own. He makes the most frugal agreements, and avoids all payments that he can avoid with honor. For instance, there is a balance not very large due to me, on my account of wagons and forage supplies to General Braddock. I presented the account to his Lordship, who had it examined and compared with the vouchers ; and on report made to him that it was right, ordered a warrant to be drawn for the payment ; but before he signed it he sent for me, told me that as the money became due before his time, he had rather not mix it in his accounts, if it would be the same thing to me to receive it in England. He believed it a fair and just account, and as such would represent it at home, so that I should meet with no difficulty in getting it paid there. I agreed to his Lordship's proposal, and the warrant was laid aside.

I once proposed to his Lordship that if he would appoint, or advise Governor Denny to appoint, some persons of credit in Pennsylvania to examine the claims of the masters, and report to his Lordship at the end of the campaign, it would, for the present, make the minds of the sufferers more easy ; and he could then order payment for such part as he should find right for him to pay, and we might endeavour to procure satisfaction elsewhere for the rest. His Lordship declined this, saying, that he knew not whom to appoint, being unacquainted with the people ; that he did not care to trouble Governor Denny with it, of whom he must ask it as a favor ; and besides, auditors, in the plantations, of accounts against

the crown had in many instances been so partial and corrupt that they had lost all credit. If he appointed auditors, they must be some of the officers of the army who understood the affair ; and at present they were engaged in other duties.

I will not trouble you with a detail of all I said to his Lordship on this affair, though I omitted nothing material that occurred to me ; but I find he is for keeping the matter in suspense, without either promising payment or refusing to pay ; perhaps till he receives directions about it from home. He does not seem willing, however, that I should make any application there relating to it, and chooses to keep the list in his hands till his return from the campaign.

The list is, indeed, so very imperfect, that I could not promise myself much in laying it before him. Of many servants it is not noted by what officers, or in what company, or even in what regiment they were enlisted ; of others, the time they were bound for, or had served, or had still to serve, is omitted. Of others, no notice is taken of the price they cost ; nor is there any distinction of apprentices, though, perhaps, the account is the best that could be obtained, the time and other circumstances considered. Upon the whole, as the inquiry, if it is ever made by my Lord's order, will be by officers of the army, they being, in his Lordship's opinion, the fittest persons and most impartial ; as all enlistments before the commencement of his command will be rejected, and also all before the act of Parliament ; as very clear proofs of every circumstance—when the servant was

enlisted, by what officer, of what regiment, and the like—will be insisted on, and the recruiting officers at the time took such effectual care to prevent the master's knowing any thing of these circumstances, I am inclined to think very little benefit will be produced by such inquiry; and that our application at home for some allowance on that account will be better founded on what the Assembly, after their own inquiry, have thought themselves obliged to pay, than on such an imperfect list as has been sent to me. This, however, I submit; and if it should still be thought proper to apply in England on the footing of the list, another copy must be forwarded by some future opportunity.

His Lordship has on all occasions treated me with the greatest goodness, but I find frequently that wrong prejudices are infused into his mind against our province. We have too many enemies among ourselves, but I hope in time things will wear a better face. Please to present my humble respects to the House, and believe me, with great esteem, &c.,

B. FRANKLIN.

CLXI.

TO MRS. JANE MECOM.

NEW YORK, 30 May, 1757.

DEAR SISTER :—I have before me yours of the 9th and 16th instant. I am glad you have resolved to visit sister Dowse oftener; it will be a great comfort to her to find she is not neglected by you, and your

example may, perhaps, be followed by some others of her relations.

As Neddy is yet a young man, I hope he may get over the disorder he complains of, and in time wear it out. My love to him and his wife and the rest of your children. It gives me pleasure to hear that Eben is likely to get into business at his trade. If he will be industrious and frugal, it is ten to one but he gets rich, for he seems to have spirit and activity.

I am glad that Peter is acquainted with the crown-soap business so as to make what is good of the kind. I hope he will always take care to make it faithfully, and never slight the manufacture, or attempt to deceive by appearances. Then he may boldly put his name and mark, and in a little time it will acquire as good a character as that made by his late uncle, or any other person whatever. I believe his aunt at Philadelphia can help him to sell a good deal of it; and I doubt not of her doing every thing in her power to promote his interest in that way. Let a box be sent to her (but not unless it be right good), and she will immediately return the ready money for it. It was beginning once to be in vogue in Philadelphia, but brother John sent me one box, an ordinary sort, which checked its progress. I would not have him put the Franklin arms on it, but the soap-boilers' arms he has a right to use, if he thinks fit. The other would look too much like an attempt to counterfeit. In his advertisements he may value himself on serving his time with the original maker, but put his own mark or device on the papers, or any

thing he may be advised to as proper ; only on the soap, as it is called by the name of crown-soap, it seems necessary to use a stamp of that sort, and perhaps no soapboiler in the King's dominions has a better right to the crown than himself.

Nobody has wrote a syllable to me concerning his making use of the hammer, or made the least complaint of him or you. I am sorry, however, that he took it without leave. It was irregular, and if you had not approved of his doing it, I should have thought it indiscreet. *Leave*, they say, *is light*, and it seems to me a piece of respect that was due to his aunt, to ask it, and I can scarce think she would have refused him the favor.

I am glad to hear Johnny is so good and diligent a workman. If he ever sets up at the goldsmith's business, he must remember that there is one accomplishment without which he cannot possibly thrive in that trade—that is, *perfect honesty*. It is a business that, though ever so uprightly managed, is always liable to suspicion ; and if a man is once detected in the smallest fraud, it soon becomes public, and every one is put upon his guard against him ; no one will venture to try his wares, or trust him to make up his plate ; so at once he is ruined. I hope my nephew will, therefore, establish a character as an *honest* and faithful as well as *skilful* workman, and then he need not fear for employment.

And now, as to what you propose for Benny, I believe he may be, as you say, well enough qualified for it ; and when he appears to be settled, if a

vacancy should happen, it is very probable he may be thought of to supply it ; but it is a rule with me not to remove any officer that behaves well, keeps regular accounts, and pays duly ; and I think the rule is founded on reason and justice. I have not shown any backwardness to assist Benny, where it could be done without injuring another. But if my friends require of me to gratify not only their inclinations, but their resentments, they expect too much of me. Above all things I dislike family quarrels, and when they happen among my relations, nothing gives me more pain. If I were to set myself up as a judge of those subsisting between you and brother's widow and children, how unqualified must I be, at this distance, to determine rightly, especially having heard but one side. They always treated me with friendly and affectionate regard ; you have done the same. What can I say between you, but that I wish you were reconciled, and that I will love that side best that is most ready to forgive and oblige the other ? You will be angry with me here, for putting you and them too much upon a footing ; but I shall nevertheless be, dear sister, your truly affectionate brother,

B. FRANKLIN.

CLXII.

TO MRS. DEBORAH FRANKLIN.

NEW YORK, 2 June, 1757.

MY DEAR CHILD :—I have just received yours of the 29th. You do not tell me whether you take the trunk of books with you, but I suppose you do. It

is now said we are all to go on board to-morrow, and sail down to the Hook. I hope it will be so, for, having now nothing to do, my stay here is extremely tedious. Please to give my respects to Mrs. Moore, and assure her that I will take care of her letters. You will find sundry parcels that came from London, some directed to the Library Company, some for Mr. Bartram. Deliver them, if not delivered. Desire Mr. Normandy to send after me a fresh memorandum of what he wanted, Mr. Collinson having lost the former.

I hope my dear Sally will behave in every thing to your satisfaction, and mind her learning and improvement. As my absence will make your house quieter, and lessen your business, you will have the more leisure to instruct her and form her. I pray God to bless you both, and that we may once more have a happy meeting. God preserve, guard, and guide you.

It is a doubt whether your next letters will reach us here. Billy joins with me in love to all friends, and presents his duty to you and love to his sister. My duty to mother and love to all the family. I shall endeavour to write to you once more before we sail, being as ever, my dear child, your affectionate husband,

B. FRANKLIN.

CLXIII.

TO MRS. DEBORAH FRANKLIN.

LONDON, 27 July, 1757.

MY DEAR CHILD :—We arrived here well last night, only a little fatigued with the last day's journey, being

seventy miles. I write only this line, not knowing of any opportunity of sending it; but Mr. Collinson will inquire for one, as he is going out. If he finds one, I shall write more largely. I have just seen Mr. Strahan, who is well, with his family. Billy is with me here at Mr. Collinson's, and presents his duty to you and love to his sister. My love to all. I am, my dear child, your loving husband,

B. FRANKLIN.¹

CLXIV.

TO MRS. DEBORAH FRANKLIN.

LONDON, 22 November, 1757.

MY DEAR CHILD :—During my illness, which continued near eight weeks, I wrote you several little letters, as I was able. The last was by the packet which sailed from Falmouth above a week since. In that I informed you that my intermittent fever, which had continued to harass me by frequent relapses, was gone off, and I have ever since been gathering strength and flesh. My doctor, Fothergill, who had forbid me the use of pen and ink, now permits me to write as much as I can without over fatiguing myself, and therefore I sit down to write more fully than I have hitherto been able to do.

The 2d of September I wrote to you that I had had a violent cold and something of a fever, but that

¹ The packet in which he sailed was bound to Falmouth. In his autobiography, after describing the voyage, his narrow escape from shipwreck on the Scilly rocks, and his arrival in port, he adds: "I set out

immediately, with my son, for London, and we only stopped a little by the way to view Stonehenge, on Salisbury Plain, and Lord Pemberton's house and gardens, with the very curious antiquities at Wilton."

it was almost gone. However, it was not long before I had another severe cold, which continued longer than the first, attended by great pain in my head, the top of which was very hot, and when the pain went off, very sore and tender. These fits of pain continued sometimes longer than at others; seldom less than twelve hours, and once thirty-six hours. I was now and then a little delirious; they cupped me on the back of the head, which seemed to ease me for the present; I took a great deal of bark, both in substance and infusion, and too soon thinking myself well, I ventured out twice, to do a little business and forward the service I am engaged in, and both times got fresh cold and fell down again. My good doctor grew very angry with me for acting contrary to his cautions and directions, and obliged me to promise more observance for the future. He attended me very carefully and affectionately; and the good lady of the house nursed me kindly.¹ Billy was also of

¹ This lady was Mrs. Margaret Stevenson, who kept a boarding-house in Craven Street, near the Strand, and with whom Dr. Franklin lived during the whole fifteen years of his residence in London. For Mrs. Stevenson, and her daughter, Miss Mary Stevenson, who at this time was eighteen years old, he formed a strong attachment, which continued through life. His first acquaintance with Mrs. Stevenson was accidental, he being recommended to her house by some of his Pennsylvania friends who had boarded there. Miss Stevenson was a girl of excellent sense, and of a highly cultivated mind, and some of his best letters on philosophical and other subjects were written to her. In the London Guide Books, "No. 7

Craven Street," is still indicated as the house in which Dr. Franklin resided.

Miss Stevenson's time was mostly passed in the country with Mrs. Tickell, her aunt; and this absence from her mother's house was the cause of the correspondence between her and Dr. Franklin, who recommended books for her reading, directed her studies, and answered her philosophical inquiries. She was married in the year 1770 to William Hewson, a distinguished anatomist, who is known by his numerous papers in the *Philosophical Transactions*, and particularly by his work on the "*Lymphatic System*." As a reward for his anatomical discoveries he was honored with the Copley Medal. He was likewise elected a fellow of the Royal So-

great service to me, in going from place to place, where I could not go myself, and Peter was very diligent and attentive. I took so much bark in various ways, that I began to abhor it; I durst not take a vomit, for fear of my head; but at last I was seized one morning with a vomiting and purging, the latter of which continued the greater part of the day, and I believe was a kind of crisis to the distemper, carrying it clear off; for ever since I feel quite lightsome, and am every day gathering strength; so I hope my seasoning is over, and that I shall enjoy better health during the rest of my stay in England.

I thank you for writing to me so frequently and fully. I believe I have missed none of your letters yet, but those by Lyon, who was taken. You mention Mr. Scott's being robbed, but do not say to what value. Was it considerable? I have seen Mr. Ralph, and delivered him Mrs. Garrigues's letter. He is removed from Turnham Green. When I return, I will tell you every thing relating to him. In the mean time I must advise Mrs. Garrigues not to write to him again, till I send her word how to direct her letters, he being unwilling, for some good reasons, that his present wife should know any thing of his having any connexions in America. He expresses

ciety. He died in 1774, thus terminating a brilliant career at the early age of thirty-four. His widow was left with three infant children. In the mean time her fortune was increased by the death of an aunt, and she devoted herself to the care of her mother and the education of her children. Mrs. Stevenson, her mother, died in January, 1783. Mrs. Hewson con-

tinued to reside in England till 1786, when she came over with her children to Philadelphia. She lived there till 1792, and then removed to Bristol in Pennsylvania, where her eldest son had established himself, and where she died, on the 14th of October, 1795. This son went afterwards to Vera Cruz, and died there in 1802. Her grandchildren are still living (1886) in Philadelphia.

great affection for his daughter and grandchildren. He has but one child here.

I have found David Edwards, and send you some of his letters, with one for his father. I am glad to hear that our friends at Newark got well through the smallpox.

The above particulars are in answer to things mentioned in your letters, and so are what follow.

Governor Shirley's affairs are still in an uncertain state ; he is endeavouring to obtain an inquiry into his conduct, but the confusion of public affairs occasions it to be postponed. He and I visit frequently. I make no doubt but reports will be spread by my enemies to my disadvantage, but let none of them trouble you. If I find I can do my country no good, I will take care at least not to do it any harm ; I will neither seek nor expect any thing for myself ; and, though I may perhaps not be able to obtain for the people what they wish and expect, no interest shall induce me to betray the trust they have reposed in me ; so make yourself quite easy in regard to such reports.

Mr. Hunter is better than he has been for a long time. He and his sister desire to be remembered to you. I believe I left the seal with Mr. Parker. I am glad to hear that Mr. Boudinot has so seasonable a supply, and hope he will not go to mining again. I am obliged to all my friends that visit you in my absence. My love to them.

Mr. Ralph delivered me your letters very obligingly ; he is well respected by people of value here. I

thank you for sending me brother Johnny's journal ; I hope he is well, and sister Read and the children. I am sorry to hear of Mr. Burt's death. He came to me at New York with a proposal that I did not approve of, but it showed his good will and respect for me ; when I return, I will tell you what it was. I shall entertain Mr. Collinson and Dr. Fothergill with your account of Teedyuskung's visit.

I should have read Sally's French letter with more pleasure, but that I thought the French rather too good to be all her own composing. I suppose her master must have corrected it. But I am glad she is improving in that and her music ; I send her a French Pamela.

You were very lucky in not insuring the rum. We are obliged to Mr. Booth for his care in that remittance. I suppose you have wrote to acknowledge the receipt of it. I have not yet seen Mr. Burkett. I am not much surprised at Green's behaviour ; he has not an honest principle, I fear. I have not yet seen Mr. Walsteinholme, but he is arrived. I am glad you went to Elizabethtown, and that Ben has got that good girl. I hope they will do well. When you write, remember my love to her.

December 3d.—I write by little and little as I can find time. I have now gone through all your agreeable letters, which give me fresh pleasure every time I read them. Last night I received another, dated October 16th, which brings me the good news that you and Sally were got safe home ; your last, of the 9th, being from Elizabethtown. Budden's ship is not yet

come up to London, but is daily expected, having been some time at Cowes. Mr. Hall has sent me a bill, as you mention. Mr. Walsteinholme is come to town, and I expect to see him to-day. When I have inquired how things are with Green, I shall write some directions to you what to do in the affair.

I am glad to hear that Miss Ray is well, and that you correspond. It is not convenient to be forward in giving advice in such cases. She has prudence enough to judge for herself, and I hope she will judge and act for the best.

I hear there has a miniature painter gone over to Philadelphia, a relation to John Reynolds. If Sally's picture is not done to your mind by the young man, and the other gentleman is a good hand and follows the business, suppose you get Sally's done by him, and send it to me with your small picture, that I may here get all our little family drawn in one conversation piece. I am sorry to hear of the general sickness; I hope it is over before this time, and that little Franky is recovered.

I was as much disappointed in my intention of writing by the packet as you were in not receiving letters, and it has since given me a great deal of vexation. I wrote to you by way of New York the day after my arrival in London, which I do not find you have received.

I do not use to be a backward correspondent, though my sickness has brought me behindhand with my friends in that respect. Had I been well, I intended to have gone round among the shops, and bought

some pretty things for you and my dear good Sally (whose little hands you say eased your headache), to send by this ship, but I must now defer it to the next, having only got a crimson satin cloak for you, the newest fashion, and the black silk for Sally; but Billy sends her a scarlet feather, muff, and tippet, and a box of fashionable linen for her dress. In the box is a thermometer for Mr. Taylor, and one for Mr. Schlatter, which you will carefully deliver; as also a watch for Mr. Schlatter. I shall write to them. The black silk was sent to Mr. Neates, who undertook to forward it in some package of his.

It is now twelve days since I began to write this letter, and I still continue well, but have not yet quite recovered my strength, flesh, or spirits. I every day drink a glass of infusion of bark in wine, by way of prevention, and hope my fever will no more return. On fair days, which are but few, I venture out about noon. The agreeable conversation I meet with among men of learning, and the notice taken of me by persons of distinction, are the principal things that soothe me for the present under this painful absence from my family and friends. Yet those would not keep me here another week, if I had not other inducements—duty to my country, and hopes of being able to do it service.

Pray remember me kindly to all that love us, and to all that we love. It is endless to name names. I am, my dear child, your loving husband,

B. FRANKLIN.

CLXV.

FROM WILLIAM STRAHAN TO MRS. FRANKLIN.¹

LONDON, 13 December, 1757.

DEAR MADAM:—I will not write to you, for the future, as a stranger whom I never had the happiness of seeing, but as to one with whom I have been for some time acquainted; for, having had the pleasure for several months past to be personally known to what you will readily allow to be your better half, you will permit me to fancy I am by no means ignorant of the essential qualities of the other.

I had for many years conceived a very high, and now find a very just, opinion of Mr. Franklin. This I was naturally led to by the concurring testimony of everybody who knew him (for the voice of his enemies, if he ever had any, never reached me), and by the opportunities I have had of judging for myself, during my correspondence with him for a dozen years. But though the notion I had formed of him, in my own mind, before I had the pleasure of seeing him, was really, as far as it went, just enough, I must confess it was very unequal to what I know his singular merit deserves.

I own it is somewhat odd to entertain a lady with the character of her husband, who must herself, of all others, be the least ignorant in that particular. But as all who know me know that I cannot help speaking my sentiments freely on any subject that strikes me in a great degree, so I choose to write my mind in regard to Mr. Franklin, before all others, to you, because you are the most unexceptionable judge of the truth and propriety of what I say, and because I am persuaded you will listen to me, not only with patience but

¹ Mr. Strahan was printer to the king, in which station he acquired a handsome fortune. He was eminent for his talents and character. In the year 1775 he was elected to Parliament from the borough of Malmesbury, as a colleague of Mr. Fox. He died the

9th of July, 1785, at the age of 70. A long and close intimacy subsisted between him and Dr. Franklin, and much of their correspondence, which was voluminous, has been preserved, though but a small portion of Strahan's has been printed.

with pleasure ; and indeed, whatever your own personal qualities may be, however amiable and engaging in my mind, your being the choice of such a man must add greatly to your honor. To be the wife of one who has so much ability, inclination, and success, if you view him in a public capacity, in being eminently useful to his country, must necessarily confer on you great reputation ; and to be the bosom friend of one who is equally fitted to promote any kind of domestic happiness, must as necessarily be the constant spring of the most substantial comfort to you.

For my own part, I never saw a man who was, in every respect, so perfectly agreeable to me. Some are amiable in one view, some in another, he in all. Now, Madam, as I know the ladies here consider him in exactly the same light I do, upon my word I think you should come over, with all convenient speed, to look after your interest ; not but that I think him as faithful to his Joan as any man breathing ; but who knows what repeated and strong temptation may in time, and while he is at so great a distance from you, accomplish ? Besides, what a delightful expedition would this be to Miss Franklin, and how must it amuse and improve her, to see and live a while in this great city. I know you will object to the length of the voyage and the danger of the seas ; but truly this is more terrible in apprehension than in reality. Of all the ways of travelling, it is the easiest and most expeditious ; and, as for the danger, there has not a soul been lost between Philadelphia and this, in my memory ; and I believe not one ship taken by the enemy.

Is the trouble and risk, then, of such a voyage to be compared in any degree with the pleasure it will afford you and your best friends ? By no means. Instead of being afraid of the sea, we ought to have a particular regard for it, as it is so far from being a bar to the communication and intercourse of different and far distant countries, that it facilitates their correspondence in a very high degree. Nay more, it conveys in the floating castles of your mother country that

protection and assistance which I trust will soon give peace to your borders. I might urge as an additional inducement for you to come over in the spring, that the important business with which Mr. Franklin is charged in the service of his country (which I dare say you would wish above all things may be brought to a happy conclusion) may very probably detain him more than one season, which will exhaust your patience to such a degree, that you may repent, when too late, you did not listen to my advice.

Your son I really think one of the prettiest young gentlemen I ever knew from America. He seems to me to have a solidity of judgment not very often to be met with in one of his years. This, with the daily opportunities he has of improving himself in the company of his father, who is at the same time his friend, his brother, his intimate and easy companion, affords an agreeable prospect that your husband's virtues and usefulness to his country may be prolonged beyond the date of his own life.

Your daughter (I wish I could call her mine), I find by the reports of all who know her, is a very amiable girl in all respects; but of her I shall say nothing till I have the pleasure of seeing her. Only I must observe to you, that being mistress of such a family is a degree of happiness perhaps the greatest that falls to the lot of humanity. I sincerely wish you very long the unabated enjoyment of them. I leave it to your friend to write you every thing from this place you would desire to know. But I cannot take my leave without informing you that Mr. Franklin has the good fortune to lodge with a very discreet gentlewoman who is particularly careful of him, who attended him during a very severe cold he was some time ago seized with, with an assiduity, concern, and tenderness which perhaps only yourself could equal, so that I don't think you could have a better substitute till you come over to take him under your own protection. He is now perfectly recovered.

My own family are, I thank God, just now in perfect

health. My wife joins me in kindest compliments to you and dear Miss, not forgetting her honest son David¹ and his fireside. I wish you a speedy and happy meeting with your friends on this side the water, which will give great pleasure to, dear Madam, your most affectionate humble servant,

WILLIAM STRAHAN.

CLXVI.

TO JOHN PRINGLE.²

CRAVEN STREET, 21 December, 1757.

SIR :—In compliance with your request, I send you the following account of what I can at present recollect relating to the effects of electricity in paralytic cases which have fallen under my observation.

Some years since, when the newspapers made mention of great cures performed in Italy and Germany by means of electricity, a number of paralytics were brought to me from different parts of Pennsylvania, and the neighbouring provinces, to be electrized, which I did for them at their request. My method was to place the patient first in a chair, on an electric stool, and draw a number of large strong sparks from all parts of the affected limb or side. Then I fully charged two six gallon glass jars, each of which had about three square feet of surface coated ; and I sent the united shock of these through the affected limb or limbs, repeating the stroke commonly three times each day. The first thing observed was an immediate greater sensible warmth in the lame limbs that

¹ David Hall, the partner of Franklin in the printing business.

² Afterwards Sir John Pringle, and President of the Royal Society.

had received the stroke than in the others ; and the next morning the patients usually related that they had in the night felt a pricking sensation in the flesh of the paralytic limbs ; and would sometimes show a number of small red spots, which they supposed were occasioned by those prickings. The limbs, too, were found more capable of voluntary motion, and seemed to receive strength. A man, for instance, who could not the first day lift the lame hand from off his knee, would the next day raise it four or five inches ; the third day, higher ; and on the fifth day was able, but with a feeble, languid motion, to take off his hat. These appearances gave great spirits to the patients, and made them hope a perfect cure ; but I do not remember that I ever saw any amendment after the fifth day ; which the patients perceiving, and finding the shocks pretty severe, they became discouraged, went home, and in a short time relapsed ; so that I never knew any advantage from electricity in palsies, that was permanent. And how far the apparent, temporary advantage might arise from the exercise in the patients' journey, and coming daily to my house, or from the spirits given by the hope of success, enabling them to exert more strength in moving their limbs, I will not pretend to say.

Perhaps some permanent advantage might have been obtained if the electric shocks had been accompanied with proper medicine and regimen, under the direction of a skilful physician. It may be, too, that a few great strokes, as given in my method, may not be so proper as many small ones ; since by the ac-

count from Scotland of a case in which two hundred shocks from a phial were given daily, it seems that a perfect cure has been made. As to any uncommon strength supposed to be in the machine used in that case, I imagine it could have no share in the effect produced ; since the strength of the shock from charged glass is in proportion to the quantity of surface of the glass coated ; so that my shocks from those large jars must have been much greater than any that could be received from a phial held in the hand.

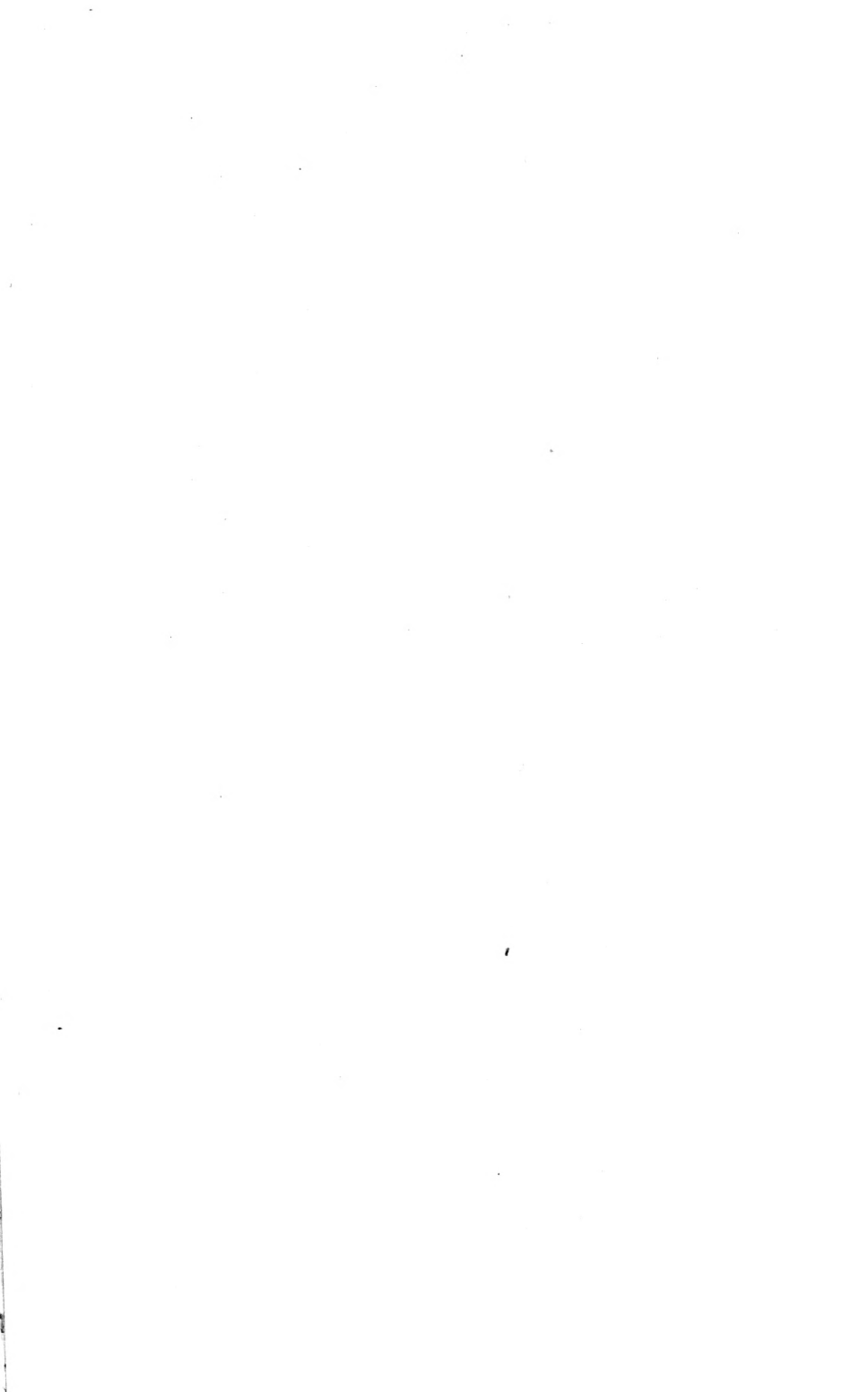
I am, with great respect, Sir,

Your most obedient servant,

B. FRANKLIN.

END OF VOL. II.





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